

4 POLICY ISSUES AND RECOMMENDATIONS

Strategic planning and management of Texas' water resources is fundamental to the provision of usable water supplies at reasonable costs and acceptable environmental impact. Projections of water-related needs made in this Plan have been based on reasonable expectations that various governmental policy and program actions will occur to keep water resources regulation, management, and development current with the needs of Texas today and tomorrow.

A wide range of issues related to water-related needs, problems, and opportunities were evaluated in this planning effort. Where appropriate, recommendations were made for Legislative, State agency, and local government consideration and action.

Major policy areas evaluated include:

- Alternative Water Supplies
- Surface Water Supply Source Management and Protection
- Ground-water Supply Source Management and Protection
- Regionalization
- Balancing Water Resources Development With Environmental and Land Management Concerns
- Financing Water Management
- Planning, Education, and Research

A summary of *priority policy recommendations*, identified as key issues by the Board, is provided in each of the above major discussion areas of water-related issues. More detailed information on these priority issues and *other important recommendations* for policy and program actions by the Legislature, State agencies, and local governments are contained in the narratives of this Section.

ALTERNATIVE WATER SUPPLIES

Until the early 1980s, the principle approach to meeting projected water supply needs in Texas was to identify new surface water and ground-water supply sources for development. The 1984 Water Plan, however, included important policy and program recommendations on using existing and future municipal and agricultural water supplies more efficiently and, to a limited extent, indicated the potential of alternative water supply management approaches, such as desalinization and water reuse, to contribute to meeting the projected water demands of the State.

The 1990 Water Plan update reinforces the significance of a number of increasingly-used alternative demand and supply management approaches in meeting the State's projected water needs. A summary of recommended key policy initiatives for alternative water supply policies and programs is presented in the inset box on the following page.

Water Conservation

In 1985, the 69th Texas Legislature redefined water conservation in the Texas Water Code to include both the development of water resources and those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for current and future consumptive and non-consumptive uses. While other parts of the 1990 Water Plan address the development of the State's water resources, the recommendations in this policy section pertain to the water demand and supply management approaches that can also be used to ensure that a sufficient supply of good quality water is available for the future of Texas.

ALTERNATIVE WATER SUPPLIES

PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
★ Establish a certification program to set maximum flow standards for plumbing fixtures and appliances purchased for use or sold within the State.	★	★	★
★ Adopt an official policy to guide State water reuse and recycling programs.	★		
★ Amend the Water Code to remove the requirement that the 50-year needs of a basin must be considered before planning for interbasin transfers of surface water.	★	★	
★ Revise the State's surface water rights review and cancellation process to assure that unused and unneeded surface water rights are made available for use.	★	★	

The eight principle methods that can be used to achieve better water use efficiencies in municipal systems include: (1) public education and information, (2) requirements for the use of water-conserving plumbing fixtures and devices in new construction, (3) retrofit programs to improve water use efficiency in existing buildings, (4) conservation-oriented water rate structures, (5) universal metering and meter repair and replacement, (6) water-conserving landscaping, (7) leak detection and repair, and (8) recycling and reuse.

Methods of agricultural water conservation include: (1) increasing the efficiency of water conveyance systems, such as replacing earthen canals with pipelines and lined canals, (2) close monitoring of water use, (3) installing efficient irrigation systems and equipment, (4) making improvements to irrigated land, such as ground leveling and drainage improvements, (5) proper use of fertilizers and chemicals to increase productivity with the use of less water, (6) using efficient irrigation scheduling techniques, such as computerized scheduling systems, and (7) other efficient water use measures.

A wide variety of water conservation measures are also available to industrial water users. Many of these techniques are specific to individual industries and have already been developed and are being implemented by industrial users in their continuing efforts to reduce costs while increasing productivity.

In response to the recognized need for water conservation by all levels of government in the State, numerous regional and local entities have been at the forefront in instituting a wide variety of water conservation programs and activities to address the particular regional and local needs of different areas of the State. Underground water conservation districts, river authorities, other regional and local districts, and municipalities, as well as private interest groups, play a vital role in achieving needed water conservation savings. Several local and regional districts and individual water users, particularly in agricultural areas, were among the first entities in the State to actively implement water conservation programs and measures.

In the period between 1986 when the Texas Water Development Board's (Board) water conservation program mandated by House Bill 2 took effect and the end of 1989, Board-approved water conservation programs in Texas have been developed by over 100 political subdivisions with a service area population of nearly six million people. Many others cities are currently developing conservation programs. The Board's agricultural water conservation assistance program has provided pilot loans to local districts of over \$8 million and grants to local districts of nearly \$500,000. Because of overwhelming public support and the potential beneficial water supply and cost effects of statewide conservation programs, the Board now considers easily achievable conservation effects in its water demand forecasts for the Water Plan.

In addition, the Texas Water Commission (Commission) was given authority in 1985 to require preparation of a water conservation plan and implementation of a program by applicants for a water rights permit. The Commission is now in the process of finalizing rules on its water conservation requirements.

While the recent legislatively assigned programs of the Board and the Commission were instituted to directly affect how water conservation is incorporated into water supply planning and development throughout the State, other State agencies also play an important role in encouraging the implementation of water conservation. The Texas Agricultural Extension Service, the Texas Department of Agriculture, the Texas Department of Health, the State Soil and Water Conservation Board, the Texas Parks and Wildlife Department, and several other agencies administer programs that encourage water conservation.

Although local, regional, and State programs to implement water conservation programs have been successful, additional follow-up actions are needed to further incorporate water conservation into water programs of the State and to encourage more comprehensive coverage of effective water conservation activities for all water users. At the State agency level, water conservation policy directives have not been fully instituted within all State agency programs, and it is appropriate for the State to take all necessary actions to use water as efficiently as the State requires of its political subdivisions. In addition, the Board, Commission, and other State agencies that conduct conservation activities need to ensure consistency among all water conservation programs, considering the diverse nature of water operations.

The State should establish a program to incorporate statewide use of low water-using plumbing fixtures and household appliances in all new construction and as replacements are needed for existing fixtures. This action will save from 20 to 40 percent of indoor water use when compared with older fixtures and appliances.

In addition to the water resource benefits from such a program, the energy savings achievable through the use of these fixtures and overall consumer cost savings can be substantial. The availability of water efficient fixtures and appliances at costs comparable to more wasteful fixtures and the ease of their use in construction makes a State program governing the sale and use of efficient fixtures and appliances a viable way to achieve substantial statewide water conservation.

While the State can do more at the State agency level and on a statewide basis, certain existing programs should be enhanced to both assist those local and regional entities that have already undertaken water conservation activities and to encourage those entities that have not fully incorporated water conservation into local water planning and development to do so.

Finally, the water conservation education and technical assistance activities conducted by Texas state agencies are very limited when compared with those of other large water-using states, such as California or Florida. Assistance to those State and local entities that do not have the resources to fully develop conservation programs needs to be provided. It is particularly important that the State develop standardized information on how to incorporate the effects of water conservation programs into long-range water plans and capital facility investment plans.

Recommendations:

- A. The Legislature should establish a certification program to set maximum flow standards for plumbing fixtures purchased for use or sold within the State. The certification program should also contain water use efficiency standards for household appliances and address commercial and agricultural irrigation systems. The effective compliance date for the program should be September 1, 1992. Enforcement of the certification program should be assigned to either the Texas Department of Health or the Texas Water Commission.

- B. The Legislature should incorporate water conservation policy goals into all appropriate activities and programs of State government, including construction and operation of State facilities. To accomplish this, three main actions need to occur.

First, all agencies responsible for constructing, leasing, or maintaining State facilities and property should be directed to use water-conserving plumbing fixtures and devices, water-efficient landscape practices, and other programs to ensure water use efficiency. The Legislature should provide funds to affected agencies to retrofit existing State facilities with water-conserving devices. The installation of water-conserving fixtures and devices has been proven to be cost effective and will, in all cases, pay for itself in water and energy cost savings.

Second, agencies responsible for education, training, or certification of water professionals, such as the Texas Department of Health, the Texas Water Commission, the State Board of Plumbing Examiners, the Texas Board of Irrigators, the Texas Water Well Drillers Board, the Texas Department of Agriculture, and the Landscape Architects Division of the Texas Board of Architectural Examiners, should be directed to incorporate water conservation into their education and certification programs.

Finally, an interagency committee should be established to evaluate additional State activities and programs that should have water conservation included as a policy mandate.

- C. Because of the number of State agencies with legislatively assigned responsibilities for encouraging water conservation activities, it is important that all of these agencies periodically consult with each other to ensure the consistency of the water conservation information provided to the public and the water conservation program requirements that are being encouraged or enforced.
- D. The Board and the Commission should enact a memorandum of understanding which clearly establishes that fulfilling the water

conservation program requirements of one agency will satisfy the requirements of the other agency, unless unusual circumstances arise. Also, the Board and the Commission should coordinate to ensure that the water conservation rules of both agencies are consistent.

- E. In order to correspond to the Board's water conservation requirements for receiving a Water Quality Enhancement or State Water Pollution Control Revolving Fund loan, the Legislature should specifically authorize the Commission to require preparation and implementation of a water conservation program by applicants for a wastewater discharge permit.
- F. The Legislature should specifically authorize the Commission to require preparation and implementation of a drought contingency plan as part of a water rights or wastewater discharge permit approval.
- G. In addition to requiring future water rights permit applicants to implement water conservation programs, the Commission should begin a program to require existing permit holders to implement water conservation programs and to prepare drought contingency plans within a two-year period.
- H. The Legislature should ensure that various legislative directives, including sufficient direction and authorization in enabling legislation, are included in the Water Code to assure that river authorities, regional water authorities and districts, underground water conservation districts, and other appropriate districts develop and institute water conservation programs to address local and regional needs, as well as to contribute to statewide goals and objectives. For example, the Legislature has included requirements in the enabling legislation of several river authorities to prepare water conservation plans, to have the plans approved by the Board, and to then implement the approved programs. Funding mechanisms and revenue generating capabilities should be included

with any directive to develop comprehensive water conservation programs by local and regional entities.

- I. The Board should be funded to increase its water conservation education and technical assistance activities. In particular, the Board should expand its current efforts and establish more comprehensive statewide water conservation education and information and unaccounted-for water reduction efforts. Other State agencies that provide education programs for water conservation should also be considered for funding enhancement where needed.
- J. The Board, the Commission, the Texas Agricultural Extension Service, the State Soil and Water Conservation Board, the Texas Department of Agriculture, and other appropriate entities need to make further efforts to encourage and facilitate implementation of water conservation measures in irrigated agriculture. Efforts should be coordinated with local districts and other water management agencies to provide education, technical assistance, and workshops on water conservation techniques and the benefits of conservation.

While this Plan includes a recommendation under the financing issue that recommends that the Legislature and the Board work to change federal tax laws to make the Board's Agricultural Water Conservation Bond program more effective, other efforts should also be increased. The Board's grant program to provide funds to local districts to purchase agricultural water-use efficiency testing and water quality testing equipment should be continued and supported by the Legislature. In addition, programs by the Texas State Soil and Water Conservation Board and local soil and water conservation districts to evaluate irrigation system efficiency, to assist in installation of efficient irrigation systems, and to provide technical assistance should be supported. Also, education and technical assistance by other State agencies to districts, cities, and individuals in agricultural areas should be enhanced.

- K. The Board, the Commission, and the Texas Department of Health should be funded to conduct interagency studies to evaluate changes in water treatment and distribution systems and wastewater collection and treatment system facilities planning and construction standards to reflect operational efficiencies and cost savings achievable through water conservation. As part of this process, the Board should work to determine better methods of accounting for water conservation practices already in place, as well as the effects of practices to be implemented in the future.

Water Reclamation, Reuse, and Effects on Water Rights

Reuse of reclaimed wastewater is a viable method of increasing the usefulness of a limited water supply. Many areas in Texas currently reuse treated wastewater for landscape and agricultural irrigation, industrial process water, aquifer recharge, and other activities. In addition, unplanned reuse has been common in Texas for a long time, as treated wastewater is discharged into streams to be later withdrawn as water supply by a downstream user. The central issues affecting full utilization of reuse techniques have been health concerns, relative cost-effectiveness, and the rights to reclaimed water, especially when the water is used to maintain streamflow.

Currently, the Texas Water Commission and the Texas Department of Health are cooperating to implement rules to clarify how reclaimed wastewater, including "greywater", may be used. However, the Texas Water Code does not include a clear policy statement of the State's position on reuse. Also, some additional research is needed to determine the possible health and environmental effects of reuse and land application of wastewater.

The Texas Water Commission recently published proposed rules that encourage the substitution of reclaimed water in place of potable water where appropriate. As one requirement of the rules, major domestic wastewater dischargers must prepare a

study to consider the appropriateness and cost effectiveness of substituting reclaimed water for potable water or fresh water within one year of issuance of any new, amended, or renewed wastewater discharge permit.

Reclaimed water is defined as municipal wastewater that is under the direct control of the treatment plant owner or operator which has been treated to a quality suitable for a beneficial use. Under the rules, the Commission will review water rights with respect to the proposed reclaimed water use plans. The rule changes also address water rights, specifically return and surplus water, by clarifying that the water rights holder has the authority to continue to reuse appropriated water as long as it is for the purposes authorized in the permit, unless the permit specifically requires the return of water once it has been initially used.

Because of the potential supply volume involved, water reclamation and reuse should be given the same level of consideration, from a State water planning standpoint, as development of additional water resources. The expanding consideration of reuse alternatives makes it necessary for the State to take an active role in defining the safe and authorized uses of reclaimed wastewater, identifying programs where reuse should be automatically considered as an alternative, and examining the effects of an expanded reuse program, including the effects on return flows to satisfy downstream needs.

Recommendations:

- A. The Legislature should adopt an official policy to guide State water reuse and recycling programs. The policy should favor the reuse of reclaimed water where such reuse is economically feasible and can be accomplished without undue risk to public health, the environment, or existing water supplies. The policy should clearly differentiate between reuse and land disposal of wastewater.
- B. The Legislature should authorize and provide funds to the Board, Commission, and Texas

Parks and Wildlife Department to conduct a joint study to expand the State's knowledge of return flow needs of State streams and how those streams will be affected by either increased reuse or, alternatively, additional use of freshwater supplies.

- C. The Board and Texas universities should receive funding to conduct further education activities to instruct and inform the public and water professionals about reuse alternatives.

Desalinization

In the past, non-conventional approaches to water supply development, such as desalinization, were considered expensive when compared to development or transportation of usable fresh water to areas of need. Thus, although desalinization has been technologically feasible in a number of areas for some time, the use of such technology has not been seriously considered in many cases. However, advancements in membrane technology have made the cost of desalinization more in line with conventional water treatment techniques.

Therefore, given the location and amount of brackish and saline water that occurs in Texas (see maps on pages IV. 14-16 in Volume 2 of Water For Texas, Texas Department of Water Resources, 1984), and the increasingly limited supply of fresh water available to meet projected demands, desalinization needs to be further incorporated into the water supply plans developed in the State. In particular, desalinization should be considered as a primary supply option in certain geographical areas.

Recommendations:

- A. The Board should expand its programs to evaluate brackish water availability and should conduct workshops with local governments and utilities on desalinization and its viability for extending freshwater supplies. In conjunction with this effort, the Board should coordinate with State universities to encourage inclusion of desalinization technology into water resources and civil engineering curricula.

B. The Board and the Texas Department of Health should establish an agreement on the identification of areas where desalinization should be considered as the primary water supply option.

C. The Legislature should support national efforts to promote desalinization, such as are being done by the National Water Supply Improvement Association.

Reservoir Storage Reallocation

During the past 30 years, water storage capacity of about one-half million acre-feet has been permanently reallocated from hydropower, navigation, and flood control storage to water supply purposes in seven U.S. Army Corps of Engineer reservoirs in Texas. However, the potential for reallocation in federal projects to address future water needs has barely been realized.

Three major factors have prevented storage reallocation from being more actively evaluated in recent years as a major source of water supply. First, estimates of hydropower, navigation, streamflow augmentation, and flood control storage in federal reservoirs are not readily available or are confusing to parties interested in evaluating storage reallocation as an alternative water supply source. Second, engineering and economic studies to determine reallocation's potential and environmental studies to determine associated ecological impacts are complicated, expensive, and time consuming. Third, the current repayment policy of the Corps of Engineers, which has not been authorized by Congress, requires that water reallocated from existing storage be paid for as if it were being constructed today (i.e., replacement cost) rather than being repaid at the federal government's actual or original cost.

Recommendations: Several actions are necessary to fully realize the potential that reallocation offers to meet future water needs of Texas.

A. The Board should acquire precise information on the actual authorized storage volumes in all

federal reservoir projects, conduct studies to determine amounts available for exchange or reallocation, and make the information available to all entities considering new supply source development.

B. Once the data are readily available, the Board should include storage volumes potentially available for reallocation in the Texas Water Plan in exactly the same way that potential new reservoirs are presented.

C. The Texas Legislature and State agencies should undertake a concentrated effort with the Texas congressional delegation to amend the 1958 Water Supply Act to reassert Congress' intention to promote reallocation on the basis of original construction costs.

Transfers and Marketing

Texas does not currently have a formal or effective mechanism to promote water transfers, defined as a change in the nature of use, point of diversion, place of use or period of use of water, in the interest of efficient water use. Importantly, transaction costs and legal uncertainties limit transfers. Entities holding water rights for more than one purpose may also hinder transactions. Also, the Texas Water Code requires that State plans for interbasin transfers of surface water may be considered only for water available in excess of the 50-year water supply requirements of the originating basin. Considering that interbasin transfers of surface water in excess of three million acre-feet per year are already taking place and that the 50-year needs consideration requirement places severe limitations on the State's ability to plan for the provision of water to areas of need, the 50-year limitation needs to be removed. Additional areas of uncertainty associated with the priority of municipal use, status of developed water, and quantification of consumptive use, also need legislative attention.

Concerns that will need to be addressed in conjunction with the development of a market transfer system include potential harm to downstream users or reduced flow for instream needs from changing the

location of a diversion or the intensity of use. While water would, in most cases, be transferred from an agricultural use to municipal or industrial uses, areas exporting water may experience direct or secondary economic impacts. Additionally, future water-intensive development could be precluded.

A major water rights transaction in California merits careful examination for its applicability to Texas. In return for financing water efficient improvements in an irrigation district, a district supplying municipal needs will receive over 100,000 acre-feet of the conserved water annually. Similarly, water losses in unlined canals in the Lower Rio Grande Valley can be up to 25 percent, and while some districts have secured U. S. Bureau of Reclamation funding for improvements, another 100,000 acre-feet of water could potentially be saved and made available for use in transfers each year. While salvage or conservation techniques may not appear to be affordable to an individual farmer, the value of water saved for use by others, rather than the farmer, makes the technique cost-effective.

Alternatives available to encourage marketing transfers range from modifying existing institutions to encourage marketing, while still protecting the interests of those that may potentially be harmed by such transactions, to providing for transfers through administrative actions.

Recommendations:

- A. The Legislature should amend the Texas Water Code to remove the requirement that only surface water in excess of the 50-year water supply requirements of an originating basin may be considered for interbasin water transfers. This will provide greater flexibility in supplying available water to areas most in need and should help facilitate efficient transfers and marketing of surface water rights.
- B. The Board and the Commission should comprehensively review State water law and regulations for language that restricts water transfers and recommend to the Legislature

any statutory clarification necessary to encourage voluntary water marketing and transfers.

- C. The Board and the Commission should jointly research the role of river authorities and other regional entities in encouraging the emergence of water markets.
- D. The Board and the Commission should study the feasibility of transfers between districts and cities in the Lower Rio Grande Valley and other areas in the State involving conserved water from canal improvements. The study should document costs of lining canals, quantify the amount of water that would be saved, determine significant environmental effects, and examine municipal interest in the program. If canal improvements are determined to be effective, studies of various types of transfer opportunities, mechanisms, and procedures should be conducted in other areas.
- E. It is recommended that, as restated in the Financing Water Management Section of this plan, the Board and the Texas Legislature work to change federal tax laws to make the Board's Agricultural Water Conservation Bond program more effective. Efforts at increasing the efficiency of agricultural water use will help to increase the amount of water potentially available for marketing transactions.

Water Supply Yield Enhancement

A variety of water supply management approaches are potentially available to locally increase water yield in select areas of the State over the long-term. However, measures to enhance ground-water storage through increased infiltration and artificial recharge, to control or eradicate high water-using vegetation (brush control), to improve the capability of land surfaces and water courses to delay runoff, to maximize ground-water withdrawals using secondary recovery methods, to suppress evaporation from existing surface water sources, and to increase precipitation by weather modification are not widely practiced or uniformly implementable across the State to increase water supply.

The potential water supply benefits, costs, and environmental effects of various watershed management approaches have not been entirely established. For example, while brush control has been shown to increase infiltration, it can also increase runoff and erosion. Further, it has been determined to be effective only in certain areas of the State (refer to the map on page 8 in section V of the Texas State Brush Control Management Plan, Texas State Soil and Water Conservation Board, 1987). In addition, increases in water supply by increasing infiltration or stream flow due to brush control management are difficult to measure.

Furthermore, utilization of water supply yield enhancement techniques will require that other related problems, such as environmental consequences and the surface water right to use the additional water, be addressed before any of the measures are widely accepted and practiced to increase local supplies. Also, questions relating to the financing of these activities remain unresolved, especially considering the time that may be required before the benefits of certain techniques are realized.

Water supply yield enhancement alternatives and their potential to increase local supplies should be considered in several ways. These include increasing the total amount of ground water and surface water available to a local area, altering or varying the amount of water available at different times, improving the quality of water available for supply use, and evaluating the environmental consequences.

Recommendations: While techniques to increase water supply yield are likely to produce only localized benefits, efforts to develop and evaluate augmentation measures should continue, with particular emphasis given to applying the approaches in areas with few, if any, alternative supply sources.

- A. The Board should review existing studies, such as information compiled by the Texas State Soil and Water Conservation Board, and conduct a comprehensive evaluation program, in conjunction with other appropriate State agencies, to identify areas where water supply

yield enhancement might be beneficial and to further study the possible programs that could be instituted for those areas, with the results to be incorporated into future water plans.

- B. The Board, the Texas Water Commission, the Texas Parks and Wildlife Department, the Texas State Soil and Water Conservation Board, and other State agencies should conduct cooperative studies to determine the possible environmental effects of water supply yield enhancement, and guidelines for conducting activities that fully consider environmental factors should be prepared.
- C. The Legislature should consider methods to encourage watershed yield enhancement activities, such as funding the legislatively authorized cost-share assistance program for brush management activities to be administered by the Texas State Soil and Water Conservation Board. In addition, the Board should research additional methods to encourage water supply yield enhancement activities. Possible alternatives would be to: (1) establish further State financial incentives for yield enhancement or (2) amend the Water Code to grant a preference to the party that conducts enhancement activities in acquiring the surface water rights to the increased yield in a given State stream due to those enhancement activities.

Nonuse of Surface Water Rights

Surface water rights are subject to cancellation or reduction if the water conveyed through the right is not used beneficially over a 10-year period. Under existing law, a cancellation proceeding can be initiated by the Commission when records indicate that no water has been beneficially used under a permit, certified filing, or certificate of adjudication during the previous 10 years. The holder of the permit, certified filing, or certificate of adjudication must be notified regarding consideration of cancellation, and a hearing must be held to allow presentation of evidence on whether the water has, or has not, been beneficially used for the purposes authorized. The hearing is followed by a Commission finding and action. A similar proceeding that can lead to partial cancellation is established in the Water

Code when some portion of water authorized to be appropriated is not put to beneficial use at any time during a 10-year period.

The current cancellation approach may create incentives to waste water (depending upon the ability of the Commission to determine beneficial use) and, in some instances, has been used as a rationale to not engage in conservation. The potential for cancellation also makes it advantageous for water rights holders to over-report actual use. This reduces the value of water use statistics for planning purposes. Also, the factors that the Texas Water Commission must evaluate in granting a water use permit have changed over the years to consider environmental, water quality, and conservation requirements, and as a result, there are inconsistencies between permits issued at different times. Overall, statutory provisions in Texas for surface water rights cancellation based on nonuse are relatively lenient in comparison with rules in other states.

Although forfeiture and abandonment proceedings have been infrequent, pressure for cancellation of unused rights will increase as water scarcity and competitive pressure for water rights become more acute. Extensive rights being held, but not being used, can necessitate over-investment in new facilities or even constrain economic development in areas with water supply shortages. At the same time, the potential for water rights cancellation is an incentive to engage in market transactions rather than potentially lose the right to the surface water with no compensation.

Also, in a related issue, while cancellation programs for nonuse need to be reviewed, State programs to protect and fairly manage and administer existing water rights are being further implemented and should be enhanced. In particular, established legislation provides that the Commission may divide the state into water divisions for purposes of administering surface water rights through local administration by watermasters.

Recommendations: To allow for more effective use, and conceivably, a more equitable allocation of the State's surface water supplies, several recommendations should be implemented.

- A. A revised cancellation proceeding for unused surface water rights should be developed by the Texas Water Commission. This effort must protect investments in facilities associated with those rights, beneficial water use, and foreseeable future water supply needs. The Commission's current 10-year period for review and possible cancellation or reduction of water rights based on nonuse should remain the same.

However, in order to assure that holders of surface water rights subject to cancellation are not left with debt and unusable facility investments for developing rights which are subsequently canceled, the Commission should consider instituting a market approach to allow water rights holders to recover their investments. One approach would be that, following a 10-year period of nonuse, the Commission should require a permittee holding rights in excess of future demands subject to cancellation, and for which it can be proved that substantial investment was made in developing the cancelable portion of the right, to publish a public notification of the availability for sale of the excess water rights. If the excess rights are not purchased during the two years following the notification at a reasonable price that recovers the permit holder's investment in developing the right, the Commission's cancellation proceeding should be suspended.

The Commission should determine an appropriate suspension period before those rights would be subject to further review and possible cancellation. In any water rights transaction initiated as a result of this process, the owner of the water right should be fully reimbursed for previous costs associated with developing the right, including interest expenses.

If the original owner of the water right must develop a future replacement water supply as a result of the sale, the cost associated with the sale should reflect the cost of the new supply, discounted to current prices. If potential sellers and buyers cannot mutually agree to a reasonable amount for a

transaction, the final determination of the price should be appealed to the Commission. In determining a reasonable sales price, the Commission should consider what is fair and reasonable for current and future customers of each entity.

- B. The Legislature should clarify conditions for temporary water supply contract transactions to respond to concerns regarding appropriate water rates to be charged and to ensure that the water provider maintains the legal and regulatory right to renew service or discontinue service, with proper advance notice, at the conclusion of the stated contract period.
- C. The Commission should evaluate current law and its rules concerning cancellation of water rights for nonuse to determine possible incentives for water rights holders to conserve water. One mechanism already being proposed by the Commission is to provide assurances in its rules that a current permit holder which voluntarily submits a conservation plan for approval by 1993 will not have any water conserved subject to cancellation for 10 additional years from the date their conservation plan is approved.

Possible additional actions that could be considered include: (a) extending the nonuse period for conserved water before the cancellation proceeding may occur, (b) allowing the permit holder to maintain the rights to the conserved water past the 10-year period if an active effort to market those rights is undertaken, or (c) establishing a system to give preference to the rights to conserved water to an entity that pays a permit holder for conducting the conservation activity or conducts the conservation activity itself (ex., a city lining the canals of an irrigation district in order to obtain rights to water saved).

- D. The Commission's program to establish water divisions statewide and appoint watermasters to administer each division should be continued and further supported.

Water Importation

Water supplies in a very limited number of areas in the State are projected to be insufficient to meet long-range needs. In some of those areas, water supplies are limited to finite and exhaustible quantities of ground water. In a few other areas, locally-available surface water supplies may be inadequate to meet long-term water supply needs.

Importation of water from other states has been considered as an option for Texas in the past. The 1968 Texas Water Plan made provisions for the importation of an estimated 12 to 13 million acre-feet of water per year by 2020 to meet Texas' water needs, primarily for irrigation use.

The 1984 Texas Water Plan also considered interstate importation as an alternative. However by 1984, studies had shown that major long-distance interstate diversions of water would be prohibitively expensive and politically difficult.

Under present circumstances and during the 50-year planning horizon used in this update, major interstate importation of water, distinguished from local efforts to import ground water and interstate division of surface water within a shared river basin through existing or future interstate compact agreements, is not necessary to meet projected demands.

In a related issue, the 69th Texas Legislature created the Multi-State Water Resources Planning Commission to study water importation questions and options and to work with other states in an attempt to identify available water supplies and cost-effective import supply alternatives. However, the Multi-State Commission was never provided funding by the Legislature to begin a program of work. Considering the very localized nature of water supply need and a new emphasis on using demand and supply management alternatives other than major long-distance water importation projects to meet projected needs, the future status of the Multi-State Commission needs to be clarified.

Finally, as is discussed in the Transfers and Marketing section, interbasin transfers of water within the State of Texas will continue to be considered in both State and local planning efforts. Changes are

SURFACE WATER SUPPLY SOURCE MANAGEMENT AND PROTECTION

PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
★ Require watershed management plans to protect the quality of sources.	★	★	★
★ Provide a TWDB report to the Legislature on the potential to implement a reservoir site protection program.		★	
★ Authorize TWC to impose administrative penalties to enforce dam safety regulations.	★	★	
★ Establish a fee-based dam safety inspection program to fund TWC dam safety activities	★	★	

needed to the Texas Water Code to provide greater flexibility in planning for interbasin transfers within the State.

Recommendations:

- A. The Board, as the State's water planning agency, will continue to evaluate all reasonable water supply alternatives, including interstate importation when and where appropriate, to meet the future needs of the State. The Board should be legislatively assigned the responsibilities of the Multi-State Water Resources Planning Commission.
- B. As stated under Transfers and Marketing, the Legislature should remove the requirement that only surface water in excess of the 50-year water in-basin supply requirements of the originating basin may be considered for interbasin water transfers. The removal of this requirement will provide greater flexibility in supplying available water to areas of the State most in need and should help facilitate efficient transfers and marketing of water rights.

SURFACE WATER SUPPLY SOURCE MANAGEMENT AND PROTECTION

Opportunities to develop new surface water supply sources are limited because of the lack of favorable sites, environmental conflicts, rising costs, and available water rights. Given the scarceness of new sources and growing demand, State policy must

promote full utilization of currently available resources. Consequently, it is imperative to protect existing water supply sources and needed future sources from impairment, utilize sources more efficiently, and ensure the integrity of dams impounding water supplies.

A summary of priority policy initiatives related to managing and protecting the State's surface water supply sources is presented in the inset box above.

Protecting Surface Water Supply Source Quality

Texas has done a good job of protecting existing surface water supply sources, including both streams and reservoirs, from point sources of pollution. The State has been less effective in limiting non-point pollution sources and restricting detrimental development. New, more comprehensive approaches are required to ensure that water suppliers are not forced to rely on lesser quality surface water sources and that water customers are not unnecessarily required to pay for increasingly expensive treatment techniques. Approaches being used to stop and reverse source degradation by a number of states and a variety of regional and local water suppliers throughout the United States include the formal identification of potential sources, acquisition or imposition of development restrictions for or acquisition of reservoir watersheds, and implementation of both structural (physical) and non-structural (management) measures. Structural methods which are being used or are increasing in use in Texas include physical facilities to treat or

control point and non-point source pollution from wastewater discharges, overland runoff, and other waste-generating activities.

Non-structural alternatives which should be used more by the State and local governments in Texas include programs to reduce pollutant generation, such as water conservation and waste minimization and recycling, best management practices (BMPs) to minimize pollution impacts, land development restrictions, and land acquisition of critical areas, such as wetlands, natural open space, stream and lake buffer corridors, and well recharge zones.

Recommendations: A series of actions should be taken by the State to emphasize source protection:

- A. All river authorities, regional districts, and local governments responsible for managing surface water and ground water should be given sufficient legislative authority and required to develop and implement watershed management plans to protect existing and identified potential surface water sources. In developing required programs, entities should consider the existing agricultural-related watershed management programs of soil and water conservation districts. Also, State law should ensure that regional and local authorities have the ability to raise revenues to finance watershed management programs. In addition, the watershed management efforts of soil and water conservation districts and the Texas State Soil and Water Conservation Board should be further supported.
- B. The State's water quality standards program should be revised to designate potential surface water reservoir sites as public supply.
- C. The Board should evaluate protecting critical reservoir sites in advance of need and determining the costs of funding associated mitigation projects. The acquisition of development rights or easements and other protection alternatives could be considered in lieu of complete purchase. Following the Board's evaluation, a report should be provided to the Legislature on the potential to

implement a reservoir site protection program.

- D. The Board should expand its financing programs to more fully support and encourage the use of low-intensity structural non-point source measures and non-structural alternatives to protect water quality. The Legislature should also provide funding for cooperative non-point source pollution projects involving more than one State agency and for projects on State-owned lands.

Reservoir Operations and Capacity Maintenance

Texas currently has 188 major reservoirs that provide a substantial percentage of the surface water used in the State. However, a number of the impoundments have experienced accelerated sedimentation, and successive reservoirs located on a river system, as well as individual reservoirs, may not be used to their full operational potential to supply water. Because developing water sources is very expensive, the capability of existing projects to continue to supply the maximum amount of water must be protected and enhanced.

Current State policy encourages reservoirs to be locally planned, permitted, and operated on an individual basis even though the experience of several river authorities indicates that reservoir systems operation procedures provide an opportunity to increase available supplies by 20 to 50 percent without new development. At the same time that supplies can potentially be increased through systems operations, current activities to maintain the usable capacity of existing reservoirs must be expanded to ensure that present and potentially available supply quantities are not diminished.

Capacity Maintenance Recommendations:

- A. The Legislature should expand funding for a Board program that measures the amount and nature of sediment accumulating in existing reservoirs. A report on the rate and nature of sedimentation for all major supply reservoirs, as well as environmental effects of dredged

material removal and disposal, should be completed within five years, and the results incorporated into a future water plan revision.

Similarly, a program to determine sediment needs and dynamics of the State's rivers, bays, and estuaries should be undertaken. Also, a Board program to educate water planners and engineers about techniques for and the benefits of preventing sedimentation and routing sediment through existing and planned reservoirs should be established.

- B. The State's water financing programs should be expanded to clearly provide funding authority for sedimentation basins, non-structural approaches, such as vegetative barriers and erosion control measures, and the removal and beneficial use of settled material in conjunction with protecting storage in existing or future reservoirs.
- C. The State should vigorously support expanded federal funding for land management programs intended to reduce erosion and resulting reservoir sedimentation. As sediment sources affecting reservoirs are identified, State agencies, such as the Texas Water Commission and the State Soil and Water Conservation Board, should work with federal agencies, such as the federal Environmental Protection Agency and the Department of Agriculture's Soil Conservation Service and Agricultural Stabilization and Conservation Service, to target federal funds for the most critical areas. An added benefit of the program should also be an overall improvement in water quality.

Systems Operations Recommendations:

- A. State water rights legislation should be reviewed and, if necessary, revised to ensure that the Texas Water Commission has adequate authority to require that plans for the systematic operation of individual reservoirs and multiple reservoirs be developed. If multiple reservoir owners or operators exist for a group of connected reservoirs, the entities

should be required to cooperatively prepare a systems operation plan. The reservoirs may be connected because they are located in the same basin or because conveyance facilities allow water to be transported across basin boundaries.

The Commission should be charged with promulgating procedures and guidelines to be used in preparing the reservoirs systems operations plans, including real-time data acquisition techniques; modeling protocols; and methods for determining net water supply charges, costs and benefits, and acceptable environmental impacts and any mitigative actions produced as a result of operations optimization. The Texas Water Code should recognize that an entity(ies) making more water available by undertaking system operations should be given preference in obtaining a water right to beneficially use the demonstrated additional yield.

Dam Safety

Uneven regulation of floodplain development and the aging of dams in the State pose an increasing risk to property, economic welfare, and human safety. In response, increasing demands are being placed on the Texas Water Commission's dam safety program.

Long-term problems affect the safety of the State's 6,300 dams and the security of 30 percent of the State's surface water supply. These problems include the lack of consistent information on all of the State's 6,250 non-federal dams, downstream development which results in a change in the hazard classification, upstream development which increases watershed runoff, permit issuance for only those dams covered by the State's water rights permitting process, inadequate enforcement procedures, and insufficient financial resources to upgrade deficient structures.

Recommendations:

- A. The Legislature should consider establishing a fee-based dam safety inspection program to

GROUND-WATER SUPPLY SOURCE MANAGEMENT AND PROTECTION

PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
★ Provide TWDB and TWC support to local districts to develop management policies.		★	★
★ Increase field enforcement of ground-water quality protection regulations.	★	★	★
★ Evaluate State ground-water data systems.		★	

fund the activities of the Texas Water Commission. When authorized, the Commission should work closely with affected entities and individuals to implement the program.

- B. The Legislature should require local governments and regional entities, such as river authorities, to adopt, under the direction of the Commission, watershed management plans to reduce potential dam safety and reservoir operations problems.
- C. The Texas Water Commission should be adequately funded to continue and expand its educational and public awareness program to inform dam owners of their responsibilities and the general public of the risks associated with development below existing dams. Where dam owners do not have adequate financial resources to rehabilitate these structures and facilities, the Commission should immediately work with the owners to establish acceptable early warning programs.
- D. The Legislature should authorize the Texas Water Commission to impose administrative penalties in enforcement matters relating to dam safety.
- E. The Legislature should ensure that local entities with substandard dam facilities have adequate authority to obtain sufficient revenue needed to participate in the Board's low-interest flood protection loan program or the proposed new State water-related infrastructure financing program (see recommendation in Financing Water Management Section).

GROUND-WATER SUPPLY SOURCE MANAGEMENT AND PROTECTION

Ground water makes up a large part of Texas' usable and potentially usable freshwater resources. Planning, management, and protection of ground-water resources is an important function of local, regional, and State governments, as well as the private sector. The ground-water policy discussions in this section are separated into ground-water management and ground-water quality protection.

The division of functions between management and protection is indicative of the approach to ground-water that is presently used in Texas, whereby control of the withdrawal and use of ground water is determined locally, while the protection of usable ground water from natural or man-induced contamination and pollution is a function of all levels of government.

A summary of priority policy initiatives related to ground-water management and protection is presented in the inset box above.

Ground-water Supply Source Management

Texas law assigns the ownership of ground water to the owner of the land under which the ground water is located. This legal doctrine is distinct from the manner in which the right to divert and use surface water is assigned.

In general, surface waters in Texas are owned by the State. The right to divert and use portions of the State's surface waters are assigned and reviewed by

the Texas Water Commission. While some other states have instituted regulatory programs that allocate the use of ground water similar to the allocation of surface water, private ownership and local control of ground-water resources continues to be supported in Texas. Therefore, the policy discussions and recommendations presented in this Plan are not intended to subvert the current State laws pertaining to a landowner's ownership rights to the ground water occurring beneath that landowner's property.

With the preceding assurance, there are a many areas that need consideration at the local, regional, and State level to assure that an adequate supply of ground water supplies are available and that problems associated with the use of ground water are addressed. Although more data is needed to draw conclusions for all individual areas, experiences in certain areas have shown that over-development of ground water has caused many problems, including water supply shortages, reduction or loss of springflow, land-surface subsidence, intrusion of poorer quality water, and increased potential for contamination by pollution sources.

Consistent with the doctrine of private ownership and local control of ground water, Texas has approached the over-use of ground water by creating underground water conservation districts and assigning the districts the responsibility and authority to develop and implement ground-water management programs. As a result, the State's 35 underground water conservation districts are promoting water conservation, collecting data, monitoring ground-water conditions, educating water consumers and the public, providing assistance to ground-water users, and implementing management requirements.

Outstanding State policy considerations related to ground water include further measures that the State can undertake to assist underground water conservation districts to implement adequate management plans, to encourage the creation of districts in problem areas, and to assure that management programs are implemented in critical areas if district creation elections fail.

At the State level, it is important that State planning agencies, in particular, the Texas Water Development Board, have the ability to obtain complete information on the availability and use of ground water in the State so that ground water can be fully considered in plans to meet the overall future water requirements of Texas. The data gathering and plan development function should be carried out in conjunction with the planning efforts of local entities, but it should also cover those areas where a local entity, such as an underground water conservation district, is not present to collect data and develop planning proposals on ground-water use. Therefore, additional measures are needed to: (1) provide the Board with information concerning the availability and use of ground water, and (2) assure that State planning goals and needs and local area planning goals and needs are compatible, consistent, and mutually considered by all levels of government.

Recommendations:

- A. Underground water conservation districts that collect data currently provide available information to State agencies concerning the use of ground water within their areas. However, the resources of the districts may be too limited to permit the information needed by the State to be collected. The Board should be funded to offer additional technical assistance to local districts to increase their capability to gather water use information, and monetary assistance should be provided to districts that assist the State in gathering ground-water availability and use information. In addition, the Board should be funded to increase its ground-water monitoring and data collection activities for areas not covered by a district or other appropriate entity. This increased data collection effort is necessary to enhance the State's ability to develop the long-range State Water Plan.
- B. Chapter 52, Texas Water Code, requires that underground water conservation districts prepare and implement management plans to address ground-water problems within their areas. These plans are to be filed with the Texas Water Commission. The Texas Water

Commission should encourage underground water conservation districts to submit copies of their management plans.

- C. As part of its statewide water planning function, the Board has identified planning goals for each ground-water area of the State, which in turn are incorporated into the water plan for the entire State. The Commission should ensure that copies of the districts' plans are provided to the Board for incorporation into statewide plans for the development and management of ground water. As part of subsequent water plans, the Board should coordinate its planning goals with local entities, including underground water conservation districts, the Commission, and other appropriate State agencies to ensure that the needs of the local area and the State are addressed.

As part of this activity, the Board should develop more comprehensive State planning assistance programs for local districts. Additional funding is needed to provide planning assistance and promote local coordination. Other State agency programs that provide assistance to local districts and other entities on methods to manage and conserve ground water, such as programs by the Texas Agricultural Extension Service, the State Soil and Water Conservation Board, the Texas Department of Agriculture, the Texas Department of Health, and the Texas Water Commission, should also receive additional support.

- D. In those areas with identified existing or potential ground-water problems where the State is unable to establish a district to manage ground water, the Legislature should amend the Water Code to give the Texas Water Commission appropriate authority, consistent with the management authority provided to districts in Chapter 52, Texas Water Code, to work with local entities to establish necessary ground-water management measures. In order to determine appropriate controls for a given area, the Commission, with assistance by the Board, should work with local entities to establish

management goals and policies. The Legislature should allow the Board to provide loan funds to local entities to implement Commission-established measures until a district is created which can then repay the Board and fund necessary measures.

- E. In order to assure that underground water conservation districts have sufficient means to implement needed programs, the Legislature should ensure that the districts have appropriate methods to raise sufficient revenue.

Ground-water Quality Protection

Newly defined and statutorily assigned policy and goals concerning the protection of ground water in Texas specify that the existing quality of ground water will not be degraded, and where the quality has been degraded, the quality of the ground water will be restored if feasible. The State's nondegradation policy does not mean zero-contaminant discharge but, rather, that discharges regulated by the State will be conducted so as to maintain present uses and not impair potential uses or pose hazards to public health.

Based on available information, the quality of ground water in the State remains generally acceptable, and local, regional, and State entities have all contributed to ground-water protection. However, results of current studies indicate that localized areas, primarily in industrialized urban areas, have been impacted by non-point sources of contamination and from contamination by point source activities not constructed or operated in compliance with protective performance standards or regulations.

Some of the major ground-water quality problems of the State were discussed in Chapter 1. The main contamination sources that have been identified include: (a) improperly completed or abandoned water wells, (b) improperly completed or abandoned oil and gas wells and abandoned oil field waste disposal pits, (c) improperly sited or constructed

septic systems, sewage and wastewater disposal systems, and municipal collection lines, (d) industrial wastewater impoundment sites that were in use before more stringent performance standards were enacted, (e) leaking oil and gasoline storage tanks, (f) waste disposal sites, including sites that were inadequately monitored and controlled in the past, (g) agricultural practices, such as improper fertilizer or chemical application and seepage from various sources resulting in high nitrate content, (h) contamination from naturally occurring substances or the intrusion of poor quality water into freshwater aquifers, and (i) other possible non-point sources of contamination, including urban stormwater runoff over recharge areas.

The extent of the ground-water quality problem varies across the State, and many of the problems are already being addressed through combinations of State and local actions. For some of the problems, however, the State is still in the process of determining the extent of contamination and the effects on ground water.

Contamination of ground water from natural sources or intrusion of poorer quality water into freshwater aquifers may affect the largest amount of the State's usable ground-water resources. In addition, a recent report by the Texas Ground Water Protection Committee lists 2,244 documented cases of human-caused ground-water contamination as reported by the State agencies responsible for ground-water quality regulation, monitoring, and enforcement.

The report states that the contamination incidents fall under the following jurisdictions: 90 percent under the Texas Water Commission, two percent under the Railroad Commission of Texas, seven percent under the Texas Department of Agriculture, and less than one percent under the Texas Department of Health. The primary contaminants identified in these cases of human-induced contamination are gasoline, diesel, and other petroleum products from the large number of leaking petroleum storage tanks.

The State currently has programs in effect to address many sources of human-induced contamination. However, the State agencies could use additional resources to quickly and fully implement the programs, such as underground storage tank leak identification and regulatory enforcement, abandoned well identification and plugging, and landfill monitoring and mitigation. Some areas may still need further statutory or agency program direction.

In addition, the number of different State agencies responsible for ground-water programs makes coordination and interaction between agencies important. A ground-water data interface system has been developed to coordinate agency data sharing. However, additional efforts are needed to expand the scope of the data, update data management techniques, and improve interagency cooperation for the interface system.

At the local level, the ability of local and regional governmental entities to enact ground-water protection measures may be limited. In particular, local and regional entities in areas containing sensitive ground-water recharge areas and other areas more susceptible to contamination need to have the authority, the tools, and the incentive to enact protection programs.

Recommendations:

- A. An interagency Texas Ground Water Protection Committee was created in 1985 and codified by the Legislature in 1989 to consider and coordinate ground-water protection strategies for the State. The efforts of the Committee and the cooperating agencies should be continued and enhanced through funding to increase data collection and evaluation of the characteristics of the State's aquifers, the quality of ground water and the extent of its use, and the management initiatives needed at all levels of government to implement the State's nondegradation policy. In particular, funding for the Board's studies of the occurrence of natural contaminants, currently considered to

be the most common type of contamination of usable ground water in the State, and of the feasibility of natural contaminant removal needs to be increased.

In addition, the Ground Water Protection Committee is working to develop a strategy to define and control contamination from agricultural chemicals (fertilizer and pesticide) and wastes. The Committee's strategy should be supported and funding provided for implementation. Also, State agencies should complete and implement strategies for addressing problems identified in the Ground Water Protection Committee's ground-water non-point source assessment. The Board should work to better incorporate findings made through the various ground-water quality studies into future updates of the Water Plan.

- B. Local efforts at ground-water quality data collection need to be encouraged and supported. The Board program for providing funding to local districts to obtain ground-water quality testing equipment should be continued and possibly expanded by raising the amount of interest funding available to the Board from the Agricultural Trust Fund.
- C. Concurrent with additional studies of ground-water quality, the Legislature needs to provide the State agencies responsible for water quality enforcement programs with additional funding to increase their field enforcement efforts, especially for abandoned well identification and plugging, onsite waste disposal (septic) system regulation, the underground storage tank program, industrial waste site cleanup, and landfill monitoring and contamination mitigation. In particular, the Railroad Commission of Texas' field enforcement capabilities and activities for ground-water regulations pertaining to the oil and gas industry should be enhanced. As part of its ground-water protection responsibilities, the Railroad Commission should use underground water conservation districts, through contract agreements or delegation of authority, to assist in monitoring oil and gas industry activities in certain areas

for compliance with ground-water protection regulations. Well plugging regulation monitoring is an example of where local districts could help expand the Railroad Commission's monitoring capabilities.

- D. The Legislature should direct the Ground Water Protection Committee to evaluate existing State ground-water data systems and make recommendations to the Legislature, which may include legislative funding or individual agency budget requests, so that the systems will allow ready access and ensure usability of data maintained by different State agencies.
- E. The Legislature should increase funding for the Wellhead Protection Program being implemented by the Texas Water Commission and the Texas Department of Health. This type of preventive program should be encouraged and enhanced at all levels of government within the State.
- F. The Ground Water Protection Committee should review the need for more local, regional, and State authority to enact comprehensive ground-water protection regulations, including development controls, and make formal recommendations as part of the next Ground-water Protection Strategy. As part of this process, the Legislature should provide the Board and the Commission funding to increase efforts to identify areas currently needing additional protection and areas of potential future water supplies that need to be protected. The Committee should review the information available from the Board and Commission and make recommendations to the Legislature for providing local and regional entities any additional authority to develop and enact protection plans for identified areas.
- G. The Commission has made advances, through the DRASTIC mapping program, in the use of computer-aided mapping and geographic information systems to make ground-water information available to local and regional planners.

REGIONALIZATION			
PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
★ Establish a formal policy which preferentially favors feasible regional, rather than individual, system development.	★	★	
★ Fund State financial assistance programs at a sufficient level to provide financing terms that will allow these programs to be used as an effective regionalization incentive.	★	★	
★ Authorize TWDB and TWC to designate water and wastewater utility service areas where regionalization may be preferable	★	★	

The Legislature should support this program and provide funding to the Commission to increase its efforts, to the Board to better incorporate this technology and information into its water planning and local assistance activities, and to other water-related agencies through the guidance of the Ground Water Protection Committee and the Texas Natural Resource Information System to use the mapping and geographic information system technologies available to increase ground-water management and protection capabilities in the State.

State agencies should continue to work together to further identify areas sensitive to ground-water contamination and in need of protection and to assist local and regional entities to enact programs for sensitive areas.

REGIONALIZATION

State policies should encourage cost-effective provision of water and wastewater service with acceptable environmental impacts, regardless of the type of facility or the institutional structure chosen. In many instances, regionalization, which may include either physical facilities or management agreements, is an effective way to achieve these objectives.

Experience with most regional water and wastewater utility systems has demonstrated the advantages of regionalization, including cost-effective service, improved operations, and more consistency in meeting water quality and drinking water

requirements. Recent trends in infrastructure provision, including funding constraints and more demanding State and national environmental and public health regulations, increase the viability of regional systems.

Despite demonstrated advantages, regional approaches are not appropriate in all cases. Characteristics of the area needing service, including development densities and distance between areas of concentrated population, may affect the economic viability of regional options. The effluent discharge from a large regional wastewater plant could have a more deleterious effect on water quality than the same volume discharged by several smaller facilities. A regional facility may also cause more significant secondary environmental effects than localized facilities.

On balance, the benefits provided by feasible regional systems, both management agreements and facilities, can outweigh the disadvantages, and a coordinated State program incorporating financial incentives, district formation requirements, and technical assistance should be undertaken to encourage regionalization where it is a feasible alternative to individual facilities. The program must be flexible in design to accommodate the varied conditions in Texas.

A summary of priority policy recommendations is presented in the inset box above.

Regionalization of Water Supply and Wastewater Systems

A number of problems at the State and local utility level create impediments to regionalization. These typically include a strong tradition of local control, competition and distrust among entities leading to the lack of political cooperation, concerns of elected officials about losing direct influence over rates and delivery of services, unfamiliarity with resulting benefits, differing rates of customer growth, unequal financial capabilities of entities, and development densities that do yet not justify regional service.

A determination of whether a regional facility alternative is the optimum technical solution can usually be made by considering physical, environmental, economic, and engineering factors separately from existing institutional constraints. The two latter factors will, however, often prevent implementation of a feasible regional solution even when it has been determined to be the most effective alternative. In particular, the involvement of multiple jurisdictions in the comparative selection of efficient engineering and economic alternatives can hamper efficient regional provision of service.

Local districts are generally the lowest-level governmental entity to provide stand-alone service. Districts can, in specialized instances, provide advantages by more directly linking benefits received to costs recovered through taxes, utility rates, and fees imposed on those receiving services rather than taxpayers at large and by maximizing flexibility in extending services to urban fringe and rural areas. While district service provision can be effective in areas where cities elect not to extend services or where regional feasibility is limited, the creation of localized and special-purpose districts is not automatically appropriate and may impede the provision of more efficient and economical regional service and interfere with the growth and annexation policies established by neighboring municipalities.

There are over 15 different types of water resource districts and more than 1,500 active and inactive individual districts in Texas. The jurisdictions

and authorities among the more than 1,500 districts are often inconsistent because district creation can occur through the general laws of the State with approval of the Commission, a special act of the Legislature, or a county commissioner's court approval for districts within a single county. While creation of new districts has been most prevalent during periods of rapid growth, the current depressed economic activity and slower growth patterns provide an ideal opportunity to encourage consolidation and to more fully evaluate the potential for regionalization during the district creation review process.

Cities, the other major provider of water and wastewater service, are the most common intermediate-size service provider between smaller local districts and larger regional entities in Texas. Cities often have opportunities for regionalization within their own boundaries in centralized utility management and inter-connecting utility facilities and operating these various plants as a system. In areas of the State where cities are geographically clustered, regional facilities among cities and other utilities are more likely to be technically feasible. In other areas of the State, including rural portions of West Texas and South Texas, regional management may be feasible, but the options for constructing regional facilities are limited because of the distances between cities and customers. However, the larger cities in these areas can provide some of the benefits of regional service by constructing larger facilities and extending service to outlying areas; in general, cities, as well as special districts, should be encouraged to fully utilize regional options in service delivery.

In addition to the traditional concept of regional utility facilities, regional management systems may also provide more cost-effective and better managed central purchasing, operations, and technical assistance for individual water or wastewater facilities. This should be recognized as part of a broader State-established definition of regional systems.

The Legislature has implicitly established a general policy to promote regionalization through authorizing provisions for individual water agency programs. However, additional actions are needed.

A first step in overcoming some of the impediments that have been outlined would be for the State to establish an explicit formal policy for regional systems. As a second step, State agencies should be provided full authority to actively pursue regionalization where it is determined to be beneficial and in the public interest. Lastly, financial incentives should be provided to help overcome the significant up-front cost typical in developing regional systems (inherent when entities are at different stages of growth), which often is a major impediment in many areas where local entities lack the front-end resources or local consensus to initiate regional system development (see discussion of State Financial Incentives for Regionalization).

Recommendations:

- A. The Legislature should enact a formal policy which preferentially favors regional, rather than individual, system development. Where feasible, approval to develop individual systems should be conditioned to require ultimate incorporation into longer-term regional systems. Regional systems, including physical facilities and management agreements, should define by statute what economic, engineering, and physical factors would constitute a regional system in a given situation.
- B. The Legislature should create a program within the Board and the Commission to study, determine, and designate water supply and wastewater service areas where regionalization may be preferable. Regional and local entities should cooperate in the study. The determination should be used, in turn, by the Commission, the Texas Department of Health, and the Board to target approval and permitting, financing, and assistance programs to promote development of regional systems.
- C. State agencies should cooperate to: (a) identify critical utility service areas characterized by numerous small or inadequate systems or water problems that threaten water quality or reliability of service, (b) designate a regional service provider, and (c) require

through regulatory processes that all proposed and existing facilities, when economically feasible and practical, participate in the regional system.

- D. The Legislature should give all regional utility authorities the ability to develop and manage regional utility systems where this would not replicate existing regional authorities with similar powers and service areas.
- E. The Legislature should authorize the Commission to approve the development of new utility facilities by municipalities, existing districts, and new districts being created only after the Commission has determined that the creation of a regional system or obtaining services from an existing regional or adjacent facility where uncommitted capacity is available or can be provided through facility expansion is technically or economically infeasible or impractical.
- F. The Legislature should ensure that statutes authorizing district creation by the Texas Water Commission include the concept of regional management or operating systems as well as regional facilities.
- G. The Texas Water Code currently authorizes the Texas Water Commission to designate regional wastewater service providers. The description of regional and areawide waste collection, treatment, and disposal facilities included in Section 26.081 of the Texas Water Code should, however, be expanded to incorporate the concept of regional or areawide management or operating systems.
- H. The Legislature should develop and establish a statutory procedure for designating regional water supply providers comparable to the designation of regional wastewater service providers currently authorized under the Water Code.

State Financial Incentives for Regionalization

State financial programs can be an important tool to encourage creation of regional systems in geographical settings where they can be beneficial.

However, two elements of the Board's current financial program authorities should be changed to better encourage regionalization. First, the Board should require in all of its financing programs that proposed projects are consistent with an State-approved regional plan. Second, the Board has also been unable to implement the State Participation Program because of the likely draw on general revenue needed for debt service costs during the early years of a State Participation project.

Recommendations:

- A. Authorizing legislation for the Board's financial assistance programs and similar legislation for related water infrastructure financing by other State agencies should be enacted to require that, where applicable, all projects receiving State funding are consistent with the long-term regional goals of a State-approved regional water supply or wastewater plan.
- B. State financial assistance programs should be funded to provide sufficiently attractive financing terms (beyond the current extension of the State's credit rating to loan recipients) to provide be more effective incentives to encourage regionalization (see Recommendations, Financing Water Management).

BALANCING WATER RESOURCES DEVELOPMENT WITH ENVIRONMENTAL AND LAND MANAGEMENT CONCERNS

Several major environmental laws were enacted by the federal government in the 1970s to prevent further deterioration of the natural environment caused by human activities and development. The 69th Texas Legislature also enacted key changes in the Water Code in 1985 to give greater emphasis to important environmental aspects of water resources decision-making, particularly freshwater inflows to bays and estuaries and flow maintenance needs for instream water uses, water quality, and fish and wildlife habitats.

Federal and State laws have contributed substantially to a more comprehensive and coordinated management of the State's water resources. These laws have slowed the degradation and improved the condition of aquatic and terrestrial biological resources dependent on wetlands, streams, lakes, bays, and estuaries. However, competition between environmental and non-environmental water uses will remain pervasive and must be given serious consideration when selecting alternatives to best meet the State's projected water needs. Similarly, conflicts between using and reserving land resources for divergent private and public purposes also influence and, in many cases, limit the water development or environmental protection options available to the State.

A summary of key policy recommendations related to balancing water development projects and environmental and land management concerns is presented in the inset box on the following page.

Environmental Uses of Water

While there are positive environmental impacts associated with water development, the principal areas of environmental conflict affecting water planning in Texas today involve determinations of the extent and suitability of fish and wildlife habitat and associated water release and other mitigation requirements necessary to support migratory waterfowl, threatened and endangered species, and viable populations of sport and commercial fish and shellfish in both freshwater and estuarine environments. The lack of sufficient data on environmental resources, disagreement over the appropriate analytical methods to use in evaluating potential or realized impacts to these resources, and conflicts in the legal responsibilities of different agencies restrict conjunctive use and contribute to less than optimum use of the State's water resources for both human and environmental purposes.

Another area of potential inconsistency and conflict involves potential duplication or differences in state and federal permitting procedures, scheduling, and requirements. The process of obtaining the

BALANCING WATER RESOURCES DEVELOPMENT WITH ENVIRONMENTAL AND LAND MANAGEMENT CONCERNS

PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
★ Encourage TWDB, TWC, and TPWD to develop a common analytical methodology to evaluate the water requirements of environmental resources.		★	
★ Prepare a TWDB report, in cooperation with the TWC and TPWD, on the feasibility of permitting each proposed reservoir site and include updates with revisions of the Water Plan.		★	
★ Create a formal program to preserve the integrity of each preliminarily proposed reservoir site.	★	★	★
★ Create an interagency committee to report on the potential to create a State river protection system.	★	★	

required State water rights permit and Section 401 water quality certification and federal Section 404 permits often involves similar studies, conducted at different times, and may produce different and inconsistent findings and permit requirements.

A final area of conflict occurs because of the lack of clear agreement on the use and acceptability of the different types and amounts of mitigation measures that are available to offset impacts of new water projects. Likewise, different evaluation methods used to determine mitigation requirements creates the potential for implementation conflicts.

Recommendations: Several actions should be undertaken to minimize areas of existing and potential environmental and water development conflict.

- A. Data collection and analytical programs need to be expanded and conducted on an on-going basis by State agencies to fully assess and quantify the value of physical and environmental resources where water development and environmental protection goals appear to be in conflict. Conflicts often occur in coastal areas, but they can also occur in inland environments. In particular, initial resource inventories and assessments for long-range water planning purposes should be conducted by the Board, in cooperation with the Commission and Texas Parks and Wildlife Department, for all reservoir sites recommended in the Texas Water Plan.

- B. State statute assigns the responsibility for determining the environmental resource requirements for water projects to the Commission and the Texas Parks and Wildlife Department. However, the Board, because of its responsibility for identifying and planning for alternatives that can meet the State's future water supply needs, has been developing a planning-level procedure to evaluate the potential water requirements of environmental resources associated with new water supply developments. This modeling technique may not necessarily agree with the results of other agencies' modeling and assessment procedures.

To avoid the further development and use of conflicting procedures among State agencies, a cooperative interagency review of the results of all procedures being applied or developed by the various agencies should be conducted. The interagency review should include the General Land Office when State-owned lands are involved. The objective of the review would be to develop a common analytical methodology, appropriate to conditions in Texas, that would be used by all State agencies to evaluate the water requirements of environmental resources.

At the conclusion of the cooperative review process, an interagency memorandum of understanding on the appropriate data set and evaluation methods to be used should be

executed by the involved agencies. A similar process should be established to ensure that all State-level mitigation determinations are made in a consistent manner. The agreements should include the understanding that agreed-upon methodologies will be flexible enough to allow for the needs and particular circumstances of each situation and that additional information may be considered. For example, while one situation may only require simple evaluation using an agreed-to desk-top method, a more complex situation may require more extensive evaluation and consideration using one or more complete evaluation models.

- C. The Commission should work with the Corps of Engineers on establishing better coordination of project permitting schedules. The Commission and the Corps should work to establish a parallel time schedule for submission, review, comment, and official action on project permit applications requiring both State and federal issuance.
- D. The Board should maintain a bay and estuary program to collect necessary data and maintain updated modeling capabilities which can be used by the Commission and the Texas Parks and Wildlife Department in making the water allocation decisions stipulated in the Texas Water Code.

Recreational Uses of Water

Other areas of conflicting surface water use involve proposals to designate segments of free-flowing streams for recreational, aesthetic, and heritage purposes and the potential for attendant unauthorized use of adjacent private property by water-based recreationalists. Recreation, aesthetic, and heritage use proposals for free-flowing rivers may be in direct conflict with other potential uses, such as the development of surface water supply reservoirs. Additionally, proposals to maintain free-flowing rivers for recreational purposes may, if not structured properly, conflict with the real property rights of private landowners.

Recommendations:

- A. In conjunction with initiation of the statewide rivers assessment proposed in the 1990 Texas Outdoor Recreation Plan (TORP), a State interagency committee should be created to identify potential conflicts and pursue agreements on the use of free-flowing riverine resources for recreational, aesthetic, and heritage purposes. An interagency report on the potential to create a State river protection system should be prepared as a legislative information document prior to January 1993. The report should include due consideration to methods to protect the rights of riverside property owners from intrusion and trespass and should clarify those types of river segments and non-navigable streams not available for public use. As appropriate, federal agencies with recreation expertise or management responsibilities in river reaches that might potentially be included in a State river system, such as the National Park Service and the U.S. Forest Service, should cooperatively participate with the interagency committee.
- B. The Board should complete a formal agreement with the Texas Parks and Wildlife Department on incorporating the appropriate water-related outdoor recreation recommendations from the Texas Outdoor Recreation Plan (TORP) into the Water Plan.
- C. The Board should encourage the involvement of State and federal agencies with water-related recreation expertise in the preparation of recreation plans developed for reservoir projects that will be constructed with State financial assistance.

Land Management

Existing and expanding human land uses create the need for water projects and influence the amount of useful water supply. Land use patterns can affect the amount of usable water supply through point and non-point source pollution loadings (especially industrial discharges and erosion) and development encroachment on potential reservoir sites.

Encroachment problems at or near desirable reservoir sites can include urban and recreational development and surface (highways and electric power lines) and subterranean (gas and oil pipelines) utility corridor routing. Deliberate actions that could be implemented by the State and local interests to reduce the prospect that potential reservoir locations may be unusable or unaffordable at the time reservoir development is needed. These actions could include restrictive zoning, land use and watershed water quality controls, and advance acquisition of reservoir sites.

The lack of adequate engineering, socioeconomic, and environmental information required to assess existing or prospective conflicting use problems and potential project feasibility creates serious obstacles to utilizing advance site acquisition to help meet the State's future surface water supply requirements. Additionally, advance site acquisition by the State implies the need for substantial amounts of up-front capital, which could require large front-end general revenue fund commitments or draws on general revenue to meet debt service repayment schedules.

Recommendations:

- A. A State program should be created to identify and catalog potential reservoir sites identified in the Texas Water Plan as needed within the next 50 years. The program should include coordinated assessments and field studies of each potential site by appropriate State agencies to determine existing and potential land use, water quality, economic, social, and environmental conflicts. A report on the feasibility of permitting each site should be prepared by the Board, with cooperation of other agencies, and updated in conjunction with official revisions of the Water Plan.
- B. A formal program to preserve the integrity of each site determined to be preliminarily feasible as a reservoir site, following consideration of alternative sites, should be created and implemented. The program should incorporate alternative methods of watershed and site protection; consider various local, State, and federal plans and

programs; and identify appropriate and alternative land uses. Highway construction planning; avoidance zoning; and utility, water quality, and waste disposal permitting should be fully coordinated and utilized to prevent compromising site integrity.

If advance site acquisition is determined to be the alternative with the greatest potential to protect a developable supply source, the Texas Water Development Board should request line-item general revenue funding in the biennial budget requests. In addition, appropriate interim land uses should be identified and authorized for sites obtained through advanced acquisition.

FINANCING WATER MANAGEMENT

The 1990 Water plan departs from previous water plans by establishing a new emphasis on improved water management. The policies that are recommended to implement improved management include a mix of voluntary and mandatory approaches ranging from technical assistance to regulation. Of the alternatives, provision of financial assistance is considered to be the most direct incentive.

Introduction

Since its beginning in 1957, State involvement in financing local water infrastructure has been guided by a legislative directive to assist hardship political subdivisions, i.e., communities that could not sell bonds or sell bonds at a reasonable rate in the public market. In 1985, the Legislature added conversion from ground water to surface water supplies, flood protection, and development of regional facilities to the list of policy purposes to be supported by State water financing. In 1989, the Legislature expanded financial eligibility to include subsidized assistance to Economically Distressed Areas.

The history of Texas government participation in providing financial assistance to local political subdivisions for water infrastructure has been predicated on several purposes. Initially, water

supply funding was provided to help communities recover from the impacts of the drought of the early and mid 1950s. However, other more fundamental structural purposes have provided the justification for the continuation and expansion of State financial assistance. These purposes include: the basic responsibility of government to provide for the essential needs of its citizens, the overall saving realized by utilizing the State's financial standing to improve borrowing and lending terms, use of financial assistance to promote State government policy, and providing for public health and economic prosperity by insuring water infrastructure availability. All of these purposes are evident in the past evolution of the State's water financing programs.

Water-related projects in Texas have been overwhelmingly funded by local and federal sources in the past. Considerable federal assistance has been provided by the Soil Conservation Service, the Bureau of Reclamation, and the Corps of Engineers to construct both major and minor surface water reservoirs. The Environmental Protection Agency, the Farmers Home Administration and the Department of Housing and Urban Development have provided substantial assistance to help finance wastewater treatment facilities. Water supply systems have been developed with funding from the Farmers Home Administration and the Department of Housing and Urban Development. A variety of other federal assistance programs have provided funds to conserve soil and water resources, abate flooding damages, and support sound water development. However, the provision of federal financial assistance has declined since the early 1980s and that trend is expected to continue in the future.

The substantial decline in federal financing, the trend toward reliance on regulatory approaches to address water problems, the emergence of a broader State role in promoting water policy initiatives, high interest rates, and changes to the federal tax code have collectively caused state governments to consider different water financing approaches that rely less on direct public market bond issuance than has been the case in the past.

While state-level legislative appropriations can be used to fund water infrastructure improvements, this approach has only been used once, with the 1981 establishment of a \$40 million Water Assistance Fund, by the State of Texas. Direct appropriations have not been uniformly applied to all problems by the federal government. To achieve the national water quality goals established in 1972, the U.S. Congress appropriated money to fund grants for local municipal wastewater treatment improvements, and although on a phase-out schedule, the federal government continues to capitalize state revolving loan funds for this purpose. Similar federal assistance programs have not been extended to help public water suppliers meet the requirements of the new Safe Drinking Water Act, but a few states have provided direct appropriations for local water supply development.

Some states use dedicated taxes for water improvements, while countries like France and Germany use pollution taxes, or effluent fees, as alternative funding mechanisms because they also discourage the waste of water and pollutant discharge. The State of Kentucky has had the authority to impose a statewide water use fee for more than 15 years. Kansas passed similar legislation and began collecting the fee two years ago, and legislation considered in Virginia would have allowed a 10 cents per thousand gallon charge on water to be used to meet the requirements of the Safe Drinking Water Act.

A portion of sales tax revenue could be directed to infrastructure improvements. Illinois taxes specific goods with the receipts directed to the Build Illinois fund. The Missouri Soil and Water Sales Tax Fund is generated through an additional state sales tax of 0.1 percent. Concerns regarding sales taxes include regressive impacts, opposition to increases due to the existing relatively high rate, and other potential demands on sales tax receipts.

Still other financing methods can lower the costs of obtaining funds. Bond insurance can reduce the cost of financing and could be particularly beneficial for relatively high-risk communities. The State of Utah

provides zero-interest loans to communities to purchase bond insurance, and although Texas is authorized to use \$250 million of the full faith and credit of the State to insure up to \$500 million worth of local bonds, the legislatively authorized program has not been activated due to uncertainties about program demand and the actual cost savings that may be realized. Additionally, start-up costs associated with the Texas program are high due to legislatively established financial soundness stipulations.

Public-private partnerships can provide alternative sources of funds and operational economies. Examples include turnkey projects, contracted private operation and maintenance, voluntary developer/municipal partnerships, involuntary developer financing, privatization, and merchant facilities. Currently, these techniques are not widely used in Texas, generally because substantive comparative advantages over current approaches are not apparent.

While some states have already instituted innovative steps to fill the void left by diminished federal assistance, Texas has just recently begun the process of rethinking its approach to providing financial assistance for water infrastructure. A 1989 survey by the Technology Resource Center at Texas A&M University identified water and wastewater as one of the top priorities of cities in Texas.

Recent national and Texas polls demonstrate extremely strong public support for environmental protection, including an expressed willingness to accept governmental expenditures or additional costs necessary to protect environmental quality. A statewide public opinion poll taken prior to the 1984 water plan indicated that a majority of Texans would be willing to pay an additional one dollar per month on their water bill, with the revenue to be dedicated to water research. A national survey completed in early 1990 indicated that the U.S. public is willing to pay more taxes dedicated to protect wildlife and wilderness, clean up water pollution, and dispose of chemicals and toxic wastes. A 1990 Rice University poll indicated strong support for environmental

protection, including 63 percent of survey respondents supporting more stringent pollution controls even if this resulted in higher costs of \$200 per year on certain products or purchases. Also, recommendations received through correspondence and public meetings on the draft 1990 Water Plan indicate considerable support for greater State involvement in water infrastructure financing.

Although economic studies prepared by the Federal Reserve Bank of Chicago have demonstrated a positive link between investment in infrastructure and economic activity, a recent national study of state conditions contributing to economic development concluded that Texas ranked lower than many other states. The study specifically identified the lack of a state infrastructure initiative as a major policy deficiency. At the same time, Texas cities and other utilities are expressing significant concerns that public policies on public health and environmental protection have come to rely too heavily on regulatory directives, compared to the past mix combining financial assistance with regulatory measures.

Federal tax legislation, budget reductions, changes in cost-sharing requirements, and more stringent public health and environmental regulations have closed many options previously available to state and local governments to finance water infrastructure. Not surprisingly, local entities are increasingly seeking more assistance from state funding sources at the very time that traditional state financing alternatives are proving limited in their ability to meet the full range of financial demands.

Smaller size systems are more likely to violate provisions of the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA), and even with use of current financial alternatives, projects may still be too costly for less populated communities. Non-point source (NPS) pollution management is expected to increase in importance and in its demand for funding as uncertainties over pollution loadings and effectiveness of treatment or management techniques are resolved. As utilities have turned to conservation as a tool for assuring adequate water supplies for the future, the ability of utilities to finance conservation

programs and activities has become an issue. A main area of concern is the ability of utilities to obtain financing for programs and projects which have not traditionally been included under state and federal financial assistance programs.

Although no loans have yet been made, limited funding for NPS structural measures is available through the State Water Pollution Control Revolving Fund. Other Board programs, such as Water Quality Enhancement Fund loans with appropriate legislative modifications, are also potential funding sources for NPS control measures. The Legislature has also authorized municipal drainage utility systems to provide a financial and institutional framework for treating urban runoff problems. In 1989, the 71st Texas Legislature also amended the Texas Water Code to specifically allow financial assistance from the Water Development Fund to be used for projects that are solely water conservation-oriented.

Some water supply and quality problems affecting Texas streams originate outside the State and require cooperative action with other states or federal agencies. In parts of the State, wastewater treatment facilities, man-made activities or natural contamination discharging into streams flowing into adjacent states may not meet other States' water quality standards. Failure to address problems originating in Mexico can cancel much of the benefits of wastewater capital improvements in Texas and threaten public health. Federal interest in and commitment to these projects has not been consistent, with resulting uncertainties in funding and considerable delay in many cases.

Interstate compacts for the Red River, the Pecos River, the Canadian River, the Sabine River, and the Rio Grande apportion water for multistate streams. The compacts may also provide a basis for cooperative action by states, and some projects with interstate benefits have been proposed or discussed in the Water Plan.

The Red River Chloride Control Project would improve the quality of water by removing salt pollutants from sources in Texas and Oklahoma and would additionally benefit Arkansas and Louisiana.

The Lake Meredith Salinity Control Project would correct salinity problems originating from natural sources in New Mexico and improve drinking water quality in the High Plains. Shreveport, Louisiana has expressed interest in securing a portion of the supply from the proposed Little Cypress Reservoir in East Texas while the Rio Grande in West Texas is affected by sedimentation and water quality problems in the watershed of Elephant Butte Reservoir in New Mexico.

One international project aimed at improving Rio Grande water quality is underway. The International Boundary and Water Commission (IBWC) will supervise construction of a new wastewater facility in Nuevo Laredo, Mexico that will reduce excessive bacteria levels in the river that result from untreated discharges originating in Mexico. The 71st Texas Legislature passed Senate Bill 2 and made federal agencies, such as IBWC, eligible to receive funding from the Water Loan Assistance Fund for certain sewer projects covered by international treaties. Texas will provide up to \$2 million in funding for the Nuevo Laredo project. While the most significant problems occur downstream of Nuevo Laredo, other border communities in Mexico may subsequently require wastewater improvements.

Another important policy question associated with State of Texas funding of interstate and international projects is whether funds should be expended in areas outside the State when sufficient financial assistance is not available for all identified needs within Texas.

Financing issues that must be considered include improving methods to generate and deliver funds, funding the most cost-effective projects, promoting rehabilitation and replacement projects equally with new project development, and developing approaches to finance emerging water management technologies.

A New Approach to Water Financing

As discussed above, the State of Texas and its local governments face a variety of significant financial challenges as a result of federal regulatory

and tax policies, antiquated and deteriorating water and wastewater facilities with inadequate capacity for new demand, competing claims for limited funds, and the emergence of new problems and priorities requiring expenditures. Consequently, it is very likely that the Legislature will be increasingly faced with requests to modify the State's financial assistance programs for water infrastructure to address limited problems or special needs.

One of the key alternatives to achieve water management goals and define the direction of water management for the next century will be development of a comprehensive water infrastructure financing approach. Rather than continuing to amend the financial assistance sections of the Texas Water Code in response to piecemeal requests or individual water problems, a preferential course would be for the Legislature to entirely revise the philosophy behind the State's provision of financial assistance for water management.

Therefore, the 1990 Water Plan recommends coordination of a new conceptual approach to a broader State involvement in water financing. A comprehensive overhaul of the State's water financing program would also have the added benefit of allowing new assistance priorities and approaches to be introduced. Although this would represent a substantial departure from past practice by the State, such an approach is warranted to minimize the problems that have been associated with national financing programs intended to further federal policy goals and to respond to State policy priorities, federally and State mandated requirements, and local water management initiatives.

The opportunity to develop and implement a new comprehensive water financing program, at the very time when a receptiveness and desire exists on the part of decision makers and the public to approach water problems differently, offers the State a range of choices on how to best address current and future water financing needs. Most importantly, the State can combine alternatives to extend its credit rating, provide economies of scale financing, consolidate and streamline previous piecemeal or fragmented

public assistance programs, and redirect expenditures to key issue areas.

Creation of a new financing approach should be predicated on the State providing more favorable economic incentives for activities and projects that are consistent with or that further the policy objectives of the State Water Plan. The new approach could be designed to provide increasing subsidies for two major categories of assistance (see Table 4-1).

At the lowest level of assistance or subsidy (Level I), the State's *credit rating could be extended* to all political subdivisions to provide for a broader array of financing assistance than currently exists. Hardship, ground-water conversion, and regionalization restrictions could be removed from the Board's current financing programs. Lower-cost financial assistance could be extended to many new eligible entities for water-related infrastructure investments not dictated by federal or State requirements, for major high cost projects with limited geographic benefits (Level IA), and for small scale direct loans not backed by local bonds (Level IB). Expanding participant eligibility in the State's loan portfolio could also offset riskier hardship loans with more conventional loans.

At a second and more restricted level of financial participation (Level II), *subsidized funding* assistance would be extended at a more favorable rate than provided under the first tier. For projects associated with significant new federal and state regulatory requirements (Level IIA), subsidized low-interest revolving loans could be provided. Level IIB assistance would provide the lowest-cost financing terms. Level IIB assistance could be extended for projects that provide for essential human and social needs and that respond to broad purpose water policy objectives, such as regionalization, water conservation, and water reuse. If much of the State's infrastructure must be upgraded or replaced, it is imperative that adequate incentives be provided to effectively induce cost-efficient and less environmentally-impacting approaches to supplying these needed facility improvements which may be impeded by traditional means of behavior, lack of political cooperation, or financing constraints.

TABLE 4-1
CONCEPTUAL STRUCTURE OF NEW STATE
WATER-RELATED INFRASTRUCTURE FINANCING PROGRAM

Funding Category	Source of Funds/Backing	Type of Program Incentive	Types of Projects Funded	Rationale
Level IA	Sale of State General Obligation or Revenue Bonds/Backed with Issuance of Local General Obligation or Revenue Bonds	Low Interest Extension of State Credit Rating	<ul style="list-style-type: none"> - Misc. Major Water, Wastewater, Flood Protection, and Solid Waste Infrastructure Construction and Rehabilitation not tied to Significant New Federal/State Regulations nor limited by utility size or amount - Major Infrastructure with High Cost and Hard to Allocate, Limited Area Public Benefits (i.e. major flood protection reservoirs, chloride control, "former Corps Projects", etc.) 	<ul style="list-style-type: none"> - Expands financial assistance to wider range of water-related needs not currently eligible. Helps keep overall state water-related infrastructure in upgraded condition to promote economic development and public health and safety. - Helps fill gap caused by reduction in federal financial assistance, especially for projects that have noticeable, but more narrow, public benefit and are more difficult to allocate to specific beneficiaries.
Level IB	Sale of State General Obligation or Revenue Bonds/Backed with Direct Loan Agreement	Low Interest Extension of State Credit Rating	<ul style="list-style-type: none"> - Misc. Water, Wastewater, Flood Protection, and Solid Waste Infrastructure Construction and Rehabilitation not tied to Significant New Federal/State Regulations, but limited to small utilities (say less than 5,000 population) and capital-related loans within a certain range (more than \$10,000 but less than \$100,000) 	<ul style="list-style-type: none"> - Expands financial assistance to wider range of water-related needs not currently eligible and to utilities that cannot afford the expense of bond backing for small loan needs.
Level IIA	Board Funds and Dependable General Revenue Appropriation/Backed with Local General Obligation or Revenue Bonds	Lower Interest, Subsidized Revolving Loan Fund(s)	<ul style="list-style-type: none"> - Major Water, Wastewater, and Solid Waste Infrastructure Construction and Rehabilitation Associated with New Federal and State Regulatory Requirements (i.e., drinking water, stormwater quality, increased effluent standards, solid waste) 	<ul style="list-style-type: none"> - Assists Texas cities and utilities in dealing with the considerable, cumulative cost impact of multiple new federal and state regulations related to potable water supply and water quality protection.
Level IIB	Board Funds and Dependable General Revenue Appropriation/Backed with Local General Obligation or Revenue Bonds	Lowest Interest, More Highly Subsidized Revolving Loan Fund(s)	<ul style="list-style-type: none"> - New Level II Projects that Regionalize Two or More Utilities - Water Conservation Retrofit/Rebate Programs - Major Utility Reuse Programs - Economically Disadvantaged Areas 	<ul style="list-style-type: none"> - Provides even greater financial incentives than Level I and II assistance programs to better induce infrastructure actions that will promote key state water policy initiatives: (1) cost-effective, less impacting, cooperation-fostering regionalization (also helps improve the economics of State participation money-out through lower interest costs); (2) highly cost-effective water conserving retrofit/rebate programs that can save a significant amount of water and reduce wastewater discharge; (3) better incentives to conduct major reuse programs, where feasible, to more efficiently use water and defer new supply construction; (4) low-cost financial assistance to economically-disadvantaged areas not limited to county definitions of EDAP

FINANCING WATER MANAGEMENT

PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
* Establish a new policy approach to comprehensive water infrastructure financing.	★	★	
* Extend TWDB financial assistance programs to all political subdivisions in Texas.	★	★	
* Work with the Texas Congressional delegation to amend the provisions of the federal tax code that unreasonably limit the use of State tax-exempt financing.	★	★	★

The proposed State role for water-related finance represents a major departure from existing practice. It recognizes expanded financial assistance as instrumental to achieving State goals in the future. It is based on an assessment that conditions defining water planning and financing in the past have changed substantially. These changes are described in this report in the discussions of planning concepts and policy issues. Recognizing the implications of these recommendations on State and local finance, it is important to determine the degree of consensus on the question of an expanded state role in water-related finance.

A Task Force on Infrastructure Finance for the Future should be convened. A cross-section of geographic, public, and professional interests should be represented on the task force. The task force should examine the feasibility of implementing the proposed conceptual approach recommendations for Level II financing. The charge of the task force should be to compare future infrastructure financing needs and available resources, identify alternative revenue sources if the State assumes a larger role in financing, and recommend any modifications to financial programs necessary to promote greater efficiency in water use while protecting key environmental values, consistent with recommendations of the plan update.

A summary of priority policy recommendations related to the financing of water management is shown in the inset box above while those and other recommendations are discussed in more detail in the following discussion.

Recommendations: Legislation should be enacted to establish a new policy approach to comprehensive water infrastructure financing. This policy should include the following provisions.

- A. Legislative restrictions that limit Board financial assistance to instances of hardship, conversion from ground water to surface water, and regional facilities should be removed, and the State's credit rating should be extended to all political subdivisions in Texas.

Level I assistance involving access to the State's credit rating should be provided for lower risk water infrastructure projects that promote economic activity; projects that produce narrow or geographically limited benefits, such as flood protection, chloride control, and interstate or international projects; and projects that would have previously received federal financing.

Projects eligible for Level IA funding would include water, wastewater, flood protection, and solid waste infrastructure not tied to significant new federal or state regulation, as well as major, high-cost infrastructure producing benefits that are difficult to allocate. These projects would be eligible for lower interest produced by merely extending the State's credit rating. The rationale for easing eligibility requirements would be to help keep water infrastructure in a condition that promotes public health, safety, and economic development and to provide a State response to reductions in federal funding assistance. Additionally, a stronger loan portfolio would be less costly to manage and maintain.

A second area of eligibility (Level IB) would involve water infrastructure projects with slightly higher risk and a direct non-bond backed loan program for small communities. The small-scale loan program could utilize contracts to provide limited direct financial assistance to purchase capital equipment necessary to maintain water and wastewater system operations and to address minor violations of regulatory requirements. The Board would investigate which of these recommendations could be implemented under existing authority.

- B. A special task force should be convened to study an expanded role in State finance, including Level II finance, and a dedicated revenue source to capitalize a Board-managed trust fund to provide such assistance.

Level IIA funding would cover major water, wastewater, and solid waste facilities to meet new federal and state regulatory requirements. These projects would be eligible for lower interest subsidized loans than provided under Level I. This would assist utilities and cities in meeting the costs associated with more stringent state and federal regulations.

Level IIB funding would provide more substantial financial incentives for projects consistent with identified high priority State policies. These could include projects that would regionalize two or more utilities, water conservation retrofit/rebate programs, major utility reuse programs, and economically disadvantaged areas.

This would help promote policies of cost-effective, less impacting, cooperation-fostering regionalization; water savings through water reuse and water conservation; and service to areas that would be unlikely to acquire or upgrade service without exceptionally favorable financial assistance. Level IIB financing would also allow for State participation in regional projects, with up-front State financing and subsequent payback to the State.

Actions to Support State Water Financing

While creation of a new water financing program will contribute substantially to meeting the State's facility needs, a variety of supportive actions also should be pursued. These actions range from efforts to amend the federal tax code to helping local governments recover appropriate expenses associated with water supply provision.

In passing the Tax Reform Act of 1986, Congress sought to limit use of tax-exempt financing in order to minimize losses in federal revenue. However, the new federal restrictions on tax-exempt financing that were established in 1986 have effectively reduced local and state options for funding needed facilities.

In particular, non-profit water supply corporations are not eligible to receive loans through tax-exempt bond financing, agricultural conservation bonds authorized by Texas voters may not satisfy the tax code's private beneficiary test, and bonds designed to meet federal environmental and other mandates may not qualify as non-taxable. In response to financing problems created by federal tax reform, the Anthony Commission on Public Finance, in a report to U.S. Congressman Beryl F. Anthony, and others have argued for a tax policy that contributes to meeting national infrastructure improvement needs.

Reductions in federal spending have caused delays in or deferral of interstate projects needed to improve water quality. At the same time, the federal government has redefined national interest to withdraw a previous acknowledgement of the shared federal responsibility for projects that benefit more than one state.

In addition to the funds administered by the Board, communities can seek federal assistance for facility improvement through other State agencies or directly from federal agencies. Lack of a centralized source of funding or funding information increases the likelihood that financial assistance opportunities will be missed.

In some areas of the State, ground water is under-utilized based on the potential supply. Ground water may be perceived as an uncertain source of supply in comparison with surface water. Better knowledge of aquifers, and improved production and management techniques can make ground-water a more attractive supply option. Certain policies on recovery of costs for rate-regulated utilities can also make use of ground water more feasible.

Recommendations:

- A. The Legislature and the Board should aggressively work with the Texas congressional delegation to amend the provisions of the federal tax code that unreasonably limit the use of state tax-exempt financing. Specifically, federal law should be changed to allow water conservation-related financial assistance to individuals which is intended to significantly advance public purposes, but which may incidentally benefit individuals, to be supported through tax-exempt debt issuance. Further, restrictions that prevent extending non-taxable debt financing to non-profit water supply corporations should be removed. Finally, the federal tax code should be amended to provide that bonds issued for facilities designed to meet federal environmental and other mandates which are truly for public purpose use are classified as tax exempt.
- B. The Texas Legislature and agencies of the State should continue to support congressional funding for interstate projects designed to improve the water quality of Texas streams and receiving waters of adjacent states. The State of Texas should also ensure that the water flowing from Texas into adjacent states meets water quality criteria that will support beneficial uses established by those states.
- C. The Board, the Department of Commerce, and the Governor's Office should work together to establish a coordinated clearinghouse to assist and direct local units of government to appropriate federal and State sources of financial assistance.
- D. Related financing policy recommendations described in other portions of Chapter 4 include: (1) expanding the State financing program eligibility to cover measures such as sediment control projects designed to protect storage capabilities in existing or future surface water reservoirs (Reservoir Operations and Capacity Maintenance, recommendation B), (2) providing financial assistance to help upgrade deficient dam structures (Dam Safety), (3) adequately funding State programs to serve as incentives for regionalization (State Financial Incentives for Regionalization, recommendation B), and (4) giving local units of government authority to develop and use alternative methods to develop revenue sources to pay for flood protection measures (Threats and Hazards, Flood Protection, recommendation C).
- E. To encourage local financing responsibility, as well as participation in the State's water infrastructure financing programs, legislative initiatives should continue to be developed to authorize local districts to establish alternative non-overlapping methods to develop revenue sources that can be used to repay debt and support continuous maintenance. An example of past innovative legislative initiatives was the authorization for the use of drainage repair fees for the Harris County area in 1987.
- F. The Texas Water Commission should clarify the ability of local utilities to incorporate *reasonable* costs of protecting water quality, securing surface water supply, and developing ground-water supplies in selected cases (where further ground-water development is both feasible and cost-efficient) into utility revenue recovery mechanisms where those utility rates are reviewed by the Commission directly or on appeal.
- G. The Board should initiate a non-point source (NPS) pollution financing needs assessment in conjunction with the Texas Water Commission, Texas State Soil and Water Conservation Board, and the Texas Railroad Commission. The assessment should quantify funding amounts needed for NPS structural and non-structural measures. Additionally, the cost of

complying with new stormwater point source discharge quality requirements should also be quantified.

- H. The Board's education and technical assistance activities should apprise eligible political subdivisions of the financial assistance programs that are available to conduct water conservation programs and projects, particularly projects to increase system efficiency and reduce waste within the system as an alternative to constructing major water supply or treatment facilities.
- I. To assist small communities, utilities, and districts in meeting water-related environmental and public health requirements, the Board's technical assistance program to help identify alternative approaches should be expanded. This could include expanding both the types of entities receiving assistance and expanding the range of alternatives considered. Technical assistance is also recommended for water conservation and wellhead protection, non-point source pollution protection, and other ground-water protection programs. Additionally, it is recommended that technical outreach functions of all State agencies that manage water resources and utilities should be expanded to provide various levels of assistance in the areas of planning, engineering, finance, and management practices.

PLANNING, EDUCATION, AND RESEARCH

A summary of priority policy initiatives associated with water resources-related planning, education, and research is presented in the inset box on the following page.

Water Research

Policy makers often face uncertainty regarding the implications of water-related regulatory, planning, and investment decisions. While a research program addressing priority issues can improve water

management, strong State financial support of research programs is not typical, and research findings have not been shown to be a strong determinant of State water policies. Further, a recent nationwide study of State research and development policies has shown that State agencies have not emphasized possible infrastructure improvements resulting from science and technology.

Texas has funded more than \$7 million of research contracts using the Board-administered Research and Planning Fund since 1983. However, only \$1.1 million in the past seven years has been directed to research projects intended to introduce new technology to meet the State's water needs; the remaining funds have been primarily used for data collection projects and studies on various water-related problems. While federal research funding continues to be more significant, there is little assurance that the federal research agenda will match State concerns.

Texas universities have strong water resources research capabilities. The Texas Water Research Institute at Texas A & M serves as the focal point for federally funded water-related research. Other State universities with water research institutes include Southwest Texas State University, Texas Tech University, and the University of Texas at Austin. The Texas Agricultural Experiment Station and Texas Agricultural Extension Service also conduct water-related research, including research on improved agricultural water use efficiency. The State of Texas funds the Advanced Research Program (ARP) and Advanced Technology Program (ATP), the nation's largest competitive, state-supported university research grant program. In 1989, ARP and ATP funded approximately \$2.1 million in water-related research out of a total award of \$64 million.

In some areas, cost or dispersed settlement precludes the use of centralized wastewater treatment systems. Section 17.189 of the Water Code requires consideration of certain specified innovative, nonconventional wastewater treatment techniques as an eligibility requirement for financial assistance from the Water Quality Enhancement Fund. Also, the

PLANNING, EDUCATION, AND RESEARCH

PRIORITY POLICY RECOMMENDATIONS	LEGISLATIVE ACTION	AGENCY ACTION	LOCAL ACTION
* Update the Water Plan on a two-year revision schedule.		★	
* Direct TWDB and other State agencies and State universities to cooperatively develop a five-year water resources research agenda.	★	★	
* Establish a Water Resources Coordinating Council to encourage coordination between water and related resources agencies.	★	★	
* Establish an integrated and comprehensive flood hazard mitigation program for the State.	★	★	★
* Establish a blue ribbon panel to develop formal recommendations to address water resources impacts of climate change.	★	★	
* Establish that the decisions of the TWC on a contested case represent the State's position in any federal proceedings.	★		
* Conduct an annual coordination conference involving water supply agencies and entities and agencies and entities responsible for fish and wildlife protection.	★	★	★

Onsite Wastewater Treatment Research Council supports research and technical transfer to promote effective onsite systems.

Recommendations: A future water-related research program incorporating several components should be built on existing university and State capabilities.

- A. A five-year water resources research agenda should be jointly developed by the Board, other State agencies involved in water management, and State universities. The agenda should be used as a guide to establish priorities for research funding.
- B. A base level of at least \$1.0 million for State water-related research through the Research and Planning Fund should be available annually to provide continuity and adequate funding levels.
- C. An on-going mechanism needs to be developed to improve the linkage between universities and State agencies to ensure that the most critical research topics are addressed first, studies are not unnecessarily duplicated, and research results are made available to decision makers.

At least biennially, the Board, in conjunction with Texas universities with water research institutes, should sponsor a conference attended by State agencies, university representatives, and other water and environmental interests to help develop a consensus on water research needs.

Environmental Data Collection and Research

The evaluation and selection of alternative water projects and facilities is increasingly affected by the environmental resources that may be impacted by water development choices. Unfortunately, the capability of all levels of government involved in water resources decision-making to choose among various development, non-development, and mitigation alternatives is limited by the lack of sufficient data and the use of different evaluation techniques. To fully assess and compare the consequences of alternative facility approaches and locations, both issues need to be expeditiously resolved.

The State has a range of choices that may be individually or collectively pursued to address the incomplete data and analytical problems affecting sound environmental analyses. On one hand, the

responsibility for completing required environmental evaluations could be recognized as exclusively the responsibility of the individual, group, business, or governmental entity promoting a proposed action (i.e., the permit applicant). Since the entity proposing the action, regardless of the specific nature of the action, will be the beneficiary of the public decision that is ultimately made, the appropriate State position may be merely to have sufficient information to confirm or refute the environmental evaluations prepared by individual project proponents.

At the other end of the spectrum, the State's role could range from specifying the data set and procedures to be used to analyze the data to conducting comprehensive environmental resource inventories and establishing, independent from a project sponsor or proponent, the preliminary environmental requirements that would be associated with water development alternatives. As an example of this approach, the Board was authorized in 1985 to undertake a four-year data collection and analytical program to determine the needs for freshwater inflows to bays and estuaries. Despite the recognized difficulty and cost in obtaining and evaluating data, the State's ability to utilize evaluation results in actually implementing alternatives may be the most difficult problem to overcome.

Recommendations:

- A. The State's ability to evaluate circulation, salinity, and water quality in bays and estuaries should be expanded and improved.
- B. Additional funding is needed to expand the State's tide gage network to include 65 improved gages.
- C. Adequate funding is needed to collect data on the hydraulic conditions, aquatic habitat, and other environmental resources of rivers and streams potentially affected by recommended water supply projects. In turn, consistent procedures for evaluating instream flow needs and other environmental effects that can be accepted and utilized by all State agencies involved in making environmental resource

evaluations of water projects need to be demonstrated and applied as a part of the State's decision-making and permitting process.

Decision Support Systems

Entities at all levels of government and the private sector rely on various information sources and systems, databases, reports and records, and other decision support systems to make effective planning decisions. Currently, water and environmental-related decision support systems and activities are spread among various federal, state, and local governmental entities, as well as the private sector.

In the case of centralized governmental programs, the decision support activities generally lack focus, organization, and an effective information dissemination capability. In the private sector, the activities are often piecemeal, occasional, and may not incorporate some of the latest techniques or accepted methodologies.

The primary factors that should be considered when developing or selecting alternative decision support systems are level of approach, efficiency, and performance. Accordingly, the State needs to consider various actions to better develop effective decision support systems that promote consistency, efficiency, and improved quality in water resources planning by all levels of government and the private sector.

The most direct approach would be through centralized provision of information clearinghouse services for relevant planning data and methods which, at the same time, recognizes the valuable role of the private sector and universities in consulting and supports decision making by local entities.

Recommendations:

- A. The Texas Water Plan should be updated by the Board on a more frequent, regular basis to maintain accurate information and to keep current with ever-evolving water issues and

State policy needs. A regular two-year revision schedule is recommended for publication of plan updates.

- B. The technical outreach functions of all State agencies that manage water resources and utilities should be coordinated and expanded to provide enhanced and on-going decision support assistance in the areas of planning, environmental assessment, engineering, finance, and management practices. These activities should fully consider the role and involvement of the private sector in decision support systems.
- C. The Commission should better consider, as a part of the State's water rights and wastewater permit review and approval process, the consistency of proposed actions with the principles and conceptual direction of the State Water Plan.
- D. The growth in the capabilities of computerized information systems has greatly enhanced or has the potential to enhance the ability of various agencies to store and evaluate data and information, to conduct their programs, and to make accurate and timely information available to planners and decision-makers at all levels of government and in the private sector.

Currently, the Texas Natural Resources Information System (TNRIS), which is statutorily assigned to and located at the Texas Water Development Board, is designated as the State's interagency natural resources information clearinghouse. While TNRIS maintains data inputs from the various agencies, independent development of and limited access to data and evaluation systems by different agencies creates on-going problems, particularly when data from one agency are incompatible with systems used in another agency or by the private sector.

Texas currently has the opportunity to establish statewide standards for obtaining and sharing geographic information. Such standards would greatly enhance the capability of natural resource agencies to

access and use statewide information gathered from a multitude of sources. In particular, TNRIS data and information coordination capabilities should be enhanced. Greater authority should also be provided to TNRIS to coordinate with natural resource agencies to ensure that all agency information is accessible to other agencies. The Legislature should direct TNRIS to conduct a review and evaluation of natural resources data bases at other agencies and entities within the State, with the intent of developing recommendations for better sharing of natural resources information by the State natural resources agencies.

- E. TNRIS should expand its role as a central information coordinator and provide various governmental entities and the general public with better centralized access to natural resources, socioeconomic, and water facilities database information that underlies the State's water planning efforts.

For example, a toll-free telephone "hot" line (1-800-WTR-DATA) could be implemented within TNRIS to provide a focused single point of contact for water-related information. As a part of this effort, TNRIS staff should be expanded and further trained in adequate oversight knowledge of the various water-related programs of federal, State, and local governments and the key contact persons in those agencies.

As a next step, the Board should evaluate the possibility of providing expanded direct access, through TNRIS, to natural resources databases. This access could be provided to the public through a modern electronic data interchange system and to other agencies via wide area network technology. The Board's evaluation should include consideration of the equipment needs and possible liability problems associated with establishing a direct access system.

The Board should support TNRIS in its role as coordinator and distributor of federally-generated data and information. This should

be done through TNRIS affiliation with the Texas State Data Center (for Census data) and through the TNRIS affiliations with the Texas Mapping Advisory Committee and the U.S. Geological Survey (for cartographic data).

Also, the newly created Texas Department of Information Resources is in a position to serve as a focal point to ensure that independent agency geographic information (GIS) system and other information activities are compatible and complimentary.

TNRIS should work with the Department of Information Resources to formally advise the Legislature of needed statutory amendments resulting from enhanced data accessibility. This approach would further assist regional and local entities in obtaining local area water planning information that, due to its volume, could not be included in the State Water Plan and other State water-related documents.

Threats and Hazards

1. Drought

At least one major drought has plagued parts of Texas in every decade of the 20th century. While there is little that individual Texans can do to prevent periods of dry weather and accompanying reductions in available water, there is much that can be done to prepare plans to lessen the impact of future droughts on the people of Texas.

With increasing development in Texas, the State's water resources will become more valuable as they are extended to available supply and capacity limits. Therefore, it is important that State water planning efforts consider actions that can be taken at the state level to deal with droughts.

Existing State policy for drought planning relies primarily on actions by local and regional entities to address drought situations. Therefore, statewide efforts in support of local and regional actions should be coordinated. Alternatives that should be considered by the State range from enhancing

current local assistance programs to preparing a comprehensive statewide drought management and response plan with responsibilities assigned to applicable State agencies to take an active role in all phases of drought planning and preparedness, drought condition monitoring, drought response, and mitigation. A statewide plan would serve to coordinate State agency efforts but would not be designed to take the place of local drought planning and program implementation.

Recommendations:

- A. The Legislature should appoint an interagency drought planning task force made up of representatives of the State Division of Emergency Management, Texas Water Commission, Texas Water Development Board, Texas Department of Agriculture, Texas Department of Health, Texas Parks and Wildlife Department, State Soil and Water Conservation Board, other appropriate State agencies, universities, and various other State, regional, and local entities to develop a comprehensive State drought management plan. Representatives of the Federal Emergency Management Agency, the U.S. Department of Agriculture, the U.S. Army Corps of Engineers, the National Oceanic and Atmospheric Administration, and other federal agencies should be consulted and could also be invited to participate as part of the interagency task force.

In developing the plan, the task force should consider plans enacted by other states and model plans developed by organizations such as the Western States Water Council. Any state drought plan should also consider plans prepared by local and regional entities and should not be implemented in place of acceptable local and regional plans. Instead, a state drought plan should provide direction for coordinated actions to be taken by State agencies and assistance activities to be provided to local and regional entities to plan for a drought and to respond to droughts that occur.

B. The Legislature should amend the Texas Water Code to specifically authorize the Commission to require, where appropriate, preparation of a drought contingency plan, in addition to a water conservation plan, by applicants for water rights and wastewater discharge permits.

C. As a basis for drought contingency planning, all water suppliers and State agencies should incorporate risk-based variable demand analysis as a part of water supply planning.

D. The Board should enhance its water conservation and drought contingency planning, education, and technical assistance programs.

2. Intentional and Inadvertent Water Supply and Environmental Contamination

Maintaining the high quality of Texas' water supplies is an essential part of protecting public health, maintaining adequate supplies, and promoting the economic welfare of the State. The State's surface water and ground-water supplies are, however, subject to inadvertent and, potentially, intentional contamination. While recommendations for controlling recognizable point and non-point sources of water pollution have been presented in other policy issues, risks to the safety and security of public water supplies and facilities from natural disasters, accidental spills, illegal discharges and waste disposal, vandalism, and acts of terrorism constitute potential threats that seldom receive sufficient attention. Additionally, environmental and economic damage resulting from inadvertent contamination, such as oil spills, necessitates enhanced preparedness and response capability.

Recommendation: A variety of planning and routine practices should be promoted to safeguard the State's water supplies and environmental values associated with water resources.

A. The Texas Department of Health should be given the legislative authority to direct all public water suppliers to develop emergency water supply contamination contingency

plans.

B. The Texas Water Commission should require that all new districts with water supply responsibility prepare emergency water supply contamination contingency plans.

C. All emergency water supply contamination contingency plans should include provisions for coordination during both development and implementation with federal, state, and local emergency response personnel.

D. The Legislature should establish a strong State program to respond to oil and toxic materials spills. The program, to be coordinated between the Texas Water Commission, the General Land Office, the Railroad Commission of Texas, and the Division of Emergency Management, should include a State-level response fund, emergency response equipment stockpiles, research and technology development efforts, and the legal authority to fully recover actual damages and other costs, including expenses for damage assessment.

3. Flood Protection

While flooding causes millions of dollars of damages to property and results in the loss of life nearly every year in Texas, efforts to address flood protection needs have been given only passing attention as a part of the State water planning process in the past. The lack of significant State involvement has occurred, in part, because of an almost exclusive reliance on federal agencies to reduce flood damages. However, decreased funding, more narrowly defined interests and commitments, and increased cost-sharing requirements for federal flood protection programs are forcing the State to assume a much broader role in reducing flood losses.

Several other factors have also limited the State's involvement in flood protection. These include the enormous amount of State land that is floodprone, the absence of comprehensive information on flooding risks and damages, and the inability to prioritize between problems attributable to different

types of flooding. Although the 100-year floodplain has been mapped for most floodprone communities in Texas, many available maps are outdated and do not contain sufficiently detailed information on floodway locations and flood elevations at different frequency or recurrence intervals. In addition, ineffective enforcement or the lack of local restrictions to limit urban expansion into floodplains, the inability of local governments to raise revenues to pay for flood protection measures, and the difficulty with and the attendant controversy over implementing measures to reduce repetitive losses impede State and local initiatives to prevent or mitigate flood hazards and damages and may also result in major unmitigated damage to biological resources in the floodplain.

Recommendations:

- A. The Texas Water Development Board should develop and continuously update a comprehensive State-level database on existing and projected major flooding problems as a component of the State water planning program. The database should also be used to identify important riparian habitat and biological values and establish geographic rankings on flooding vulnerability.
- B. An integrated and comprehensive flood hazard mitigation program should be established for the State. Subchapter I (Flood Insurance and Control Act) in Chapter 16 of the Texas Water Code should be amended to require that a statewide master flood hazard mitigation plan, incorporating appropriate local and federal plans and activities, be developed as one component of the State Water Plan. The statute should also be amended to mandate a coordinated approach to enforce floodplain management requirements for State-owned lands and projects. Lastly, Subchapter I should be reviewed to identify any local or State authority deficiencies and, in turn, be revised to provide full statutory basis to develop, implement, and vigorously enforce floodplain management regulations.
- C. All local units of government, in particular districts, must be given the authority to

develop and use alternative, non-overlapping methods to develop revenue sources to pay for structural and non-structural flood protection measures. Revenue raising methods should be adequate for both construction of capital facilities or features and implementation of programs and measures not requiring construction. Local government ability to raise funds should also be sufficient to pay for flood protection planning and for facility operation, maintenance, and rehabilitation. The Legislature should consider authorizing districts throughout the State to impose impact fees, as has already been authorized for the Houston area.

4. Climate Change

Water resources decision making has always been characterized by varying degrees of uncertainty because of the inherently unpredictable nature of the hydrologic cycle. Scientific findings and public debate on climate change and its potential impact on water have introduced a vast new dimension of uncertainty into water resources planning in recent years. While research and discussion continues on the extent and severity of regional and local watershed impacts of climate change, almost universal scientific agreement on the warming of Earth's climate has now been established.

Studies and reports by the National Academy of Sciences, the American Association for the Advancement of Science, the U.S. Environmental Protection Agency, the International Water Resources Association, the International Council of Scientific Unions, and the United Nations confirm an unprecedented rapid rise in global temperatures due to the accumulation of greenhouse gases that are changing the chemical composition of the atmosphere. Average global mid-latitude temperatures are predicted to increase by two degrees Fahrenheit (1.1° Celsius) by the year 2025 and by as much as seven degrees Fahrenheit (4.0° Celsius) by the year 2100.

The water resource impacts of global climate change have the potential to seriously affect the State's economy and citizens, attributable in part to the inability of natural and man-made systems to adapt rapidly enough to the rate of predicted warming. Important water resources consequences resulting from climate warming that is already underway will likely include an increased probability of extreme flood, drought, and hurricane events; reduced precipitation and increased evaporation resulting in decreased soil moisture, ground-water recharge, and overall water availability; and a rise in sea level of several feet accompanied by higher storm surges, increased beach erosion, permanent coastal inundation, saltwater intrusion into freshwater coastal aquifers, and the destruction of marine and coastal ecosystems.

Other potential economic, physical, and biological impacts include an increase in electrical power demand for air conditioning, monumental changes in the State's wood products and agricultural industries, and the loss of natural species biodiversity; virtually every aspect of human and natural life in the State would be affected.

Also, even a minor change in climate attributable to global warming would have a substantial impact on the laws and institutions that have been established to manage Texas' water resources. In a state that is so dependent on its water resources, water managers, as well as elected decision makers, can no longer afford to ignore climate change as a variable in planning for the future use of the State's water resources.

Alternative responses available to address climate change include prevention, that is curtailing the buildup of greenhouse gases, and both passive and active adaptation. A third type of response, technical measures to counteract climate change, may, because of extreme unpredictability, cause more problems than are solved.

Recommendations: Most experts and scientific reports recommend that a combination of preventive and active adaptation measures be immediately

undertaken to modify and reduce the potential impacts of global warming. The most frequently recommended responses are those that will yield salutary benefits in their own right even if climate changes do not materialize as forecast and that will produce vastly greater benefits if changes occur as now predicted. The State's actions should be predicated on assuring the widest possible range of water management options for future choices.

- A. Water resources planning and investment decisions at all governmental levels should incorporate climate uncertainty as a formal variable and attempt to identify alternative actions or choices that will provide the State with the greatest degree of flexibility to respond to variable climate change impacts.
- B. The Governor, the Lt. Governor, and the Speaker of the House should establish a select blue-ribbon panel of credible scientists, business leaders, and public policy decision makers, chaired by the Chairman of the Texas Water Development Board, to develop formal recommendations on how State legislation, policy, and programs should be revised to respond to the water resources impacts of climate change. The panel, which could work cooperatively with the Texas Environmental Policy Forum proposed by the Texas Water Commission, should present a report with recommendations to the 73rd Regular Session of the Texas Legislature. The Board and other agencies should provide staff to the panel and every effort should be made to obtain federal assistance to support the work of the panel.

Federal/State Relationships

A variety of factors influence interactions between the State of Texas and the various arms and agencies of the federal government. Since a number of State agencies share similar water management responsibilities, there is no assurance that a consistent State policy will be expressed when dealing with federal agencies. Further, federal water policy is divided among three cabinet-level departments and a number of independent agencies. Some federal agencies are modifying their historic

roles. For example, the U.S. Bureau of Reclamation is currently emphasizing water management rather than construction, and the U.S. Environmental Protection Agency has been elevated to cabinet level. While federal agencies are providing less financial assistance to states, federal regulations continue to impose significant controls and costs on state and local governments.

Texas has ranked near the bottom of all states in total receipt of federal funds. A recent State initiative to ensure that the State is more competitive in securing funding has been undertaken. At the same time, improved State technical capabilities, in general, have decreased reliance on federal assistance. Also, experience from the 1980s decade indicates that innovative public policies are increasingly likely to originate at the state and local levels rather than the federal level, as states continue to depart from federal directives by implementing more stringent environmental requirements.

A recent national study recommended creation of a President's Water Council to provide better coordination among federal agencies, and federal legislation that would improve policy coordination with western states has been introduced. To develop a more coordinated state position on various issues, the Texas Legislature has created a number of coordinating councils, with statutes establishing coordinating entities for toxics, ground water, solid waste, and international health and environmental issues. Alternative coordinating mechanisms that could be established include informal contacts between agencies, consolidation of agencies, and agreement on common techniques for planning and evaluating water projects.

Certain federal decisions and actions can limit water supply alternatives. An example is the U.S. Fish and Wildlife Service's acceptance of a donated non-development easement to protect an area of East Texas bottomland hardwoods for migrating water fowl habitat, which conflicts with the Sabine River Authority's plans to construct the Water's Bluff Reservoir. This issue was elevated to the U.S. District Court for the Eastern District of Texas, Texarkana,

which ruled in favor of the U.S. Fish and Wildlife Service. Quoting from the summary of the court decision,

"the alleged effect of the FWS's action--elimination of a potential reservoir site--is not within the scope of NEPA because there is no causal relationship between the alleged effect and any change in the physical environment caused by the acquisition of the easement...."

Current law and regulations are directed to ensure that water resource development is evaluated with due consideration to resulting environmental effects and other tradeoffs associated with development. There is not an equivalent requirement for a formal comparison of benefits gained from protecting important wildlife habitat with benefits foregone as a consequence of foreclosing an option to construct a reservoir for which there is also a limit on resource availability, i.e. good reservoir sites. The conclusion of the court that proper coordination procedures had been observed contrasts with continuing expressions of concern that the public had insufficient input into an action with long-term implications for the area.

In broader terms, the case raises questions about the effect of easements as an intentional technique to preclude use of some of the limited number of sites recommended for new reservoirs in this plan. One alternative response could be to attempt to amend federal legislation to require preparation of an Environmental Impact Statement when a potential federal action might preclude utilization of potential reservoir sites or inadvertently foreclose other water development opportunities.

Alternatively, a formal state-level resource evaluation process could be developed that would address issues in addition to those considered under federal procedures. A short-term response would be to encourage water supply interests and fish and wildlife protection interests to cooperate to identify and to address, in advance, potential areas of conflict with balanced consideration of both development and preservation interests.

Recommendations: Until such time as a State water coordinating council may be legislatively created, the following actions should be undertaken:

- A. The Legislature should enact legislation establishing that the Texas Water Commission's decisions made through a contested case hearing represent the State's position on issues that are in any federal proceedings. All State and regional entities, including the Attorney General, should support this position in federal proceedings. This recommendation would affect only those issues where a decision has been made through the Commission's hearings process and would not apply to other issues of State concern that are considered in federal proceedings.
- B. To influence federal legislation and rules that may potentially have significant impacts on Texas, State water agencies should work closely with the Texas congressional delegation, the Office of State-Federal Relations, and organizations such as the Western States Water Council, Council of Infrastructure Financing Authorities, Western Governors' Association, Arkansas-White-Red Basins Interagency Council, Interstate Council on Water Policy, Association of State and Interstate Water Pollution Control Administrators, and Association of Drinking Water Administrators.
- C. The Texas Legislature, Board, Commission, and other water supply-related entities in the State should work with the Texas congressional delegation to enact legislation to ensure that the U.S. Fish and Wildlife Service's (FWS) acceptance of non-development easements through its Bottomland Hardwood Preservation Program does not preclude development of needed reservoirs or other water-development projects if the water-supply benefits outweigh the environmental benefits.

Legislative approaches that should be considered include requiring the FWS to: (1) give the same consideration to the water

supply needs of an area as it does to the environmental benefit derived from a non-development easement, (2) if an area proposed for an easement is designated as a reservoir or water-development site in a State Water Plan or official regional or local planning document, prepare a complete Environmental Impact Statement as part of the consideration process, and (3) conduct 10-year reviews of an easement, giving State and local entities the opportunity to present new information on the effect of the easement, with consideration given to removing the easement if water-supply needs outweigh the environmental benefits.

- D. Annual coordination conferences involving agencies with water supply responsibilities and those involved in fish and wildlife preservation should be held to address potential water resource and environmental conflicts.

Water Planning Purpose and Coordination

Agreement on the precise purpose of the State Water Plan is necessary to define the scope and the content of future plan updates. The number of diverse entities preparing local and regional plans greatly increases the likelihood of inconsistency and, therefore, the importance of State coordination.

A plan could primarily list projects to be funded or, alternatively, comprehensively examine problems, policies, and infrastructure needs. According to experts, the fundamental aspects of a water plan include an assessment of resources and needs and a comprehensive process for developing structural and management solutions that is policy-based, dynamic, and enforceable. Essential water resource planning components identified for inclusion in the State Water Plan are updated estimates of present and future water, wastewater, and flood protection needs, improved evaluation of alternatives, accelerated institutional agreement, and expanded procedures for increasing cooperation and public involvement.

Ensuring coordination in water planning in a large state, such as Texas, can be difficult given the diversity of geographic needs and the large number of affected interests. To address this problem, several State programs have coordination requirements. For example, statutes on State solid waste planning require that all plans be consistent with the State plan and that regional plans be adopted as rules. Alternatively, adequate opportunity for the public to help influence planning recommendations can also be viewed as a coordinating mechanism. For example, the Texas Outdoor Recreation Plan incorporates the broadest public participation effort of any State natural resource plan. This includes opinion surveys, regional public meetings, interviews, workshops, and wide distribution of report drafts for review and comment. Lastly, in addition to a coordination process, all planning efforts must have an effective affirmative consideration process if planning recommendations are to have generally accepted credibility.

Recommendations:

- A. The Legislature should establish a Water Resources Coordinating Council, as originally recommended in the December 1988 Report of the Governor's Committee on Water Resources Management, to encourage coordination by water and related resource agencies.
- B. State Water Plan updates should be prepared by the Board on a regular two-year interval. A report should be provided to the Legislature at the beginning of each regular session documenting the status of Plan contents.
- C. The Board should be adequately funded to develop a broader and more comprehensive on-going process for identifying and monitoring emerging water management issues so they can be incorporated into future Water Plan updates.
- D. The Board should establish a process that promotes early and full public involvement in all updates of the Water Plan.

- E. The Board should further develop and document sound and consistent planning criteria to be used in updating future water plans.
- F. Expanded interagency coordination is needed to avoid conflicts between the Water Plan and other State-prepared plans relating to water resources. The Board should develop more formal procedures, working arrangements, or agreements that establish how key water-related recommendations from plans prepared by other State agencies will be incorporated into updates of the Water Plan and vice-versa.

Environmental Dispute Resolution

Because of the limited resource constraint and the many potentially disparate interests involved, water issues are, by their very nature, contentious. Some degree of conflict is inherent in the desires of different regions, users, and levels of government to exert control over limited supplies of water. In recent years, strong public support for protecting environmental values has clashed with other competing water demands, with these conflicts often leading to litigation. With the commitment of resources required on all sides, significant issues may remain unresolved for long periods of time. Ultimately, control over decision-making may be lost to outside, higher authorities. As an alternative to an increasing number of adversarial proceedings, dispute resolution through consensus-building techniques has been increasingly employed with demonstrated success. This can range from innovative public education and planning processes to environmental mediation.

Considerations in selecting a dispute resolution approach include identifying effective methods to achieve consensus, relying on disinterested parties to lead the process, and recognizing that some interests benefit from the status quo. Concerns associated with departures from current practice include overcoming the perception that it will restrict public involvement in decision-making, assuring representation of all affected parties, and ensuring implementation once an agreement is reached.

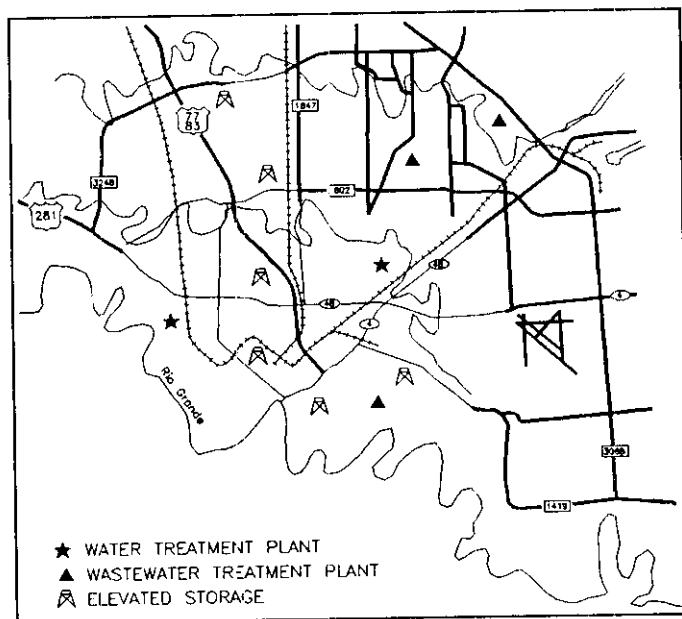
Successful resolution of disputes will encounter many obstacles regardless of the approach that is used to avoid or reduce conflict. This is especially true in long-standing conflicts where entities have firmly established views or significant economic interests. Because current efforts to resolve disputes are costly, lengthy, and characterized by limited success, the State can play a role in offering alternative approaches when local interests cannot concur or reach an acceptable compromise. The following recommendations are not intended to exclude the public or any party from the decision-making process.

Recommendations:

- A. The State Management Development Center should offer training on environmental dispute resolution for State agencies with statutory responsibilities for natural resources and for those agencies constructing major projects subject to environmental review.
- B. The Legislature should evaluate the Open Meetings and Records Act to identify any legal impediments to the use of dispute resolution approaches and techniques, such as the involvement of third party mediators and requirements for confidentiality. Consideration should be given to modifying legal restrictions that could preclude the use of conflict resolution approaches while at the same time respecting the public access principles of open government. Since proper conflict resolution approaches could involve the breadth of various entities involved in the dispute, proper balance should be maintained to protect the overall public interest.

APPENDIX A

EXAMPLES OF LOCAL UTILITY FACILITIES SUMMARIES



SYSTEM DESCRIPTIONS

WATER. The sole source of raw water for the City of Brownsville is the Rio Grande. Brownsville is at the downstream end of the river, and the water quality is partly dependent on the discharges of the riverside communities on both sides of the river. Three water pumps obtain water from the river and discharge into a large terminal reservoir. Water from the reservoir is treated and then supplied to the distribution system which contains two pressure planes.

ADJUDICATED RIGHTS #: 23-865A
 27120.446 acre/feet per annum from the Rio Grande Cameron County - Rio Grande Basin

WASTEWATER. Wastewater is collected in a network of 6 to 30 inch clay and PVC sewers. The system includes 104 lift stations. Flows are directed to three wastewater treatment plants: a 7.8 mgd activated sludge plant; a 5.0 mgd trickling filter plant; and a 0.09 mgd package extended aeration plant.

TWC PERMIT #(S): 10397-01, Q=7.8 MGD @ 20/20
 10397-03, Q=5.0 mgd @ 20/20
 10397-04, Q=0.09 mgd No Discharge

FLOOD PROBLEMS. Brownsville, like most other cities on the Texas Gulf Coast, experiences localized flooding each year. In 1987, a Master Drainage Plan was formulated for the city. At the present time, the US Army Corps of Engineers is completing a drainage plan for Cameron County.

Population:

1970 act. - 52,222
 1980 act. - 84,997
 1990 est. - 105,839
 2000 est. - 156,449
 2010 est. - 188,497
 2040 est. - 276,065

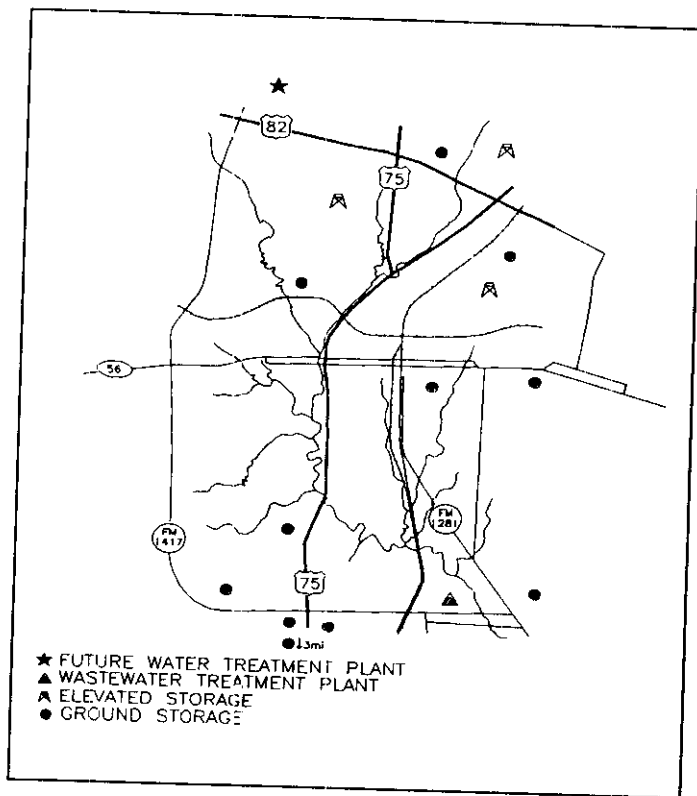
Current Capacity Data:

Water Supply: 20.0 MGD
 Elevated Storage: 7.5 MG
 Ground Storage: 6.75 MG
 Service Pumps: (4) 1020 GPM

PROJECTION OF ADDITIONAL FACILITY NEEDS

Facility Item	1990-2000		2000-2010		2010-2040		TOTAL	
	Additional Capacity	Cost (1,000\$)	Additional Capacity	Cost (1,000\$)	Additional Capacity	Cost (\$1,000)	Additional Capacity	Cost (1,000\$)
Water Supply	13.83 MGD	\$8,981	4.83 MGD	\$4,507	18.63 MGD	\$10,918	37.29 MGD	\$24,406
Elevated Storage	---	---	---	---	---	---	---	---
Ground Storage	---	---	---	---	---	---	---	---
Water Pumping	---	---	0.87 MGD	\$20	18.63 MGD	\$209	19.5 MGD	\$229
Water Distribution	927,104 LF	\$23,178	723,753 LF	\$18,094	1,897,519 LF	\$47,438	3,548,376 LF	\$88,709
Wastewater Treatment	1.15 MGD	\$1,454	2.91 MGD	\$3,341	8.85 MGD	\$9,061	12.91 MGD	\$13,856
Wastewater Collection	927,104 LF	\$36,716	723,753 LF	\$28,018	1,897,519 LF	\$80,037	3,548,376 LF	\$144,771
Flood Protection	---	---	---	---	---	---	---	---
Total Estimated Costs (1,000\$)		\$70,329		\$53,980		\$147,662		\$271,971
Potential State Funds Needed		\$10,435		\$7,868		\$20,188		\$38,491

REMARKS: Water: The City is involved in exploration work, drilling, and testing wells in a five square mile area located approximately 25 miles west of the City of Brownsville. TWDB projections show that a new channel dam will be needed by approximately 2030 to increase surface water supplies. Wastewater: The 5.0 MGD trickling filter plant will be expanded to 10 MGD capacity. Construction is to begin in late 1990.



SYSTEM DESCRIPTIONS

WATER. Supply now consists of 30 wells into the Trinity and Woodbine Aquifers. The maximum sustainable yield of the well field was measured at 8.8 mgd. The water wells have a peak pumpage rate of 17 mgd. This is at or near the maximum capacity of sustainable use of the ground-water aquifer available to the City of Sherman. A new 10.4 mgd surface water treatment plant, which incorporates a 4 mgd demineralization process, will process water from Lake Texoma. It will be owned and operated by the Greater Texoma Utility District (GTUD) and financed by the TWDB fund with a \$17.6 million loan. The distribution system consists of elevated and ground storage (15.9 mg) and pipelines between 2 and 24 inches with a booster pump capacity of 37,275 gpm. The pipelines are primarily cast iron and plastic. The distribution system has two pressure planes at Elev. 835 and at Elev. 762.

ADJUDICATED RIGHTS #s: 02-4905. Reservoir for recreational purposes 251 AC-FT. #02-4906 Reservoir for recreational purposes 350 AC-FT.

WASTEWATER. Wastewater is collected in a network of 6 to 42 inch clay, concrete, plastic and cast iron sewers. The system includes eleven lift stations. Flows are directed to a combined trickling filter-activated sludge treatment.

Population:

1970 act. - 29,061
1980 act. - 30,413
1990 est. - 31,812 (act. 34,546)
2000 est. - 34,892
2010 est. - 37,940
2040 est. - 47,702

Current Capacity Data:

Water Supply: 17.1 MGD
Elevated Storage: 3.75 MG
Ground Storage: 12.15 MG
Service Pumps: 53.7 MGD

TWC PERMIT #s: 10329-001, Q = 12 mgd @ 20/20

FLOOD PROBLEMS. Reoccurring flood damage has required constructing small watershed structures to protect the city.

SANITARY LAND FILL. Present site must be abandoned. Exploring new regional site. Under litigation.

PROJECTION OF ADDITIONAL FACILITY NEEDS

Facility Item	1990-2000		2000-2010		2010-2040		TOTAL	
	Additional Capacity	Cost (1,000\$)	Additional Capacity	Cost (1,000\$)	Additional Capacity	Cost (\$1,000)	Additional Capacity	Cost (1,000\$)
Water Supply *	---	\$1,975	---	---	---	---	---	\$1,975
Elevated Storage	---	\$900	---	---	---	---	---	\$900
Ground Storage	---	---	---	---	---	---	---	---
Water Pumping	---	---	---	---	---	---	---	---
Water Distribution	91,000 LF	\$3,759	90,000 LF	\$2,248	246,000 LF	\$6,158	427,000 LF	\$12,165
Wastewater Treatment *	2.5 MGD	\$3,075	1.03 MGD	\$1,320	3.30 MGD	\$3,745	6.83 MGD	\$8,140
Wastewater Collection *	91,000 LF	\$1,905	90,000 LF	\$2,793	246,000 LF	\$8,575	427,000 LF	\$13,273
Flood Protection *	---	\$2,745	---	---	---	---	---	\$2,745
Total Estimated Costs (1,000\$)		\$14,359		\$6,361		\$18,478		\$31,198
Potential State Funds Needed		\$1,320		\$3,745		\$8,140		\$13,205

* CIP Costs